## SEQUENCE LISTING

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Leu	Glr	a Ala 35	Leu	Asn	Thr	Pro	Ile 40	Asn	Lys	Lys	Phe	Ile 45	Lys	Ile	Cys
Arg	Glu 50	ı Leu	His	Glu	Asp	Gly 55	Gln	Pro	His	Leu	His 60	Val	Leu	Ile	Gln
Phe 65	Glu	ı Gly	Lys	Tyr	Cys 70	Cys	Gln	Asn	Gln	Arg 75	Phe	Phe	Asp	Leu	Val 80
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Val Trp Gly Glu Phe Gln Val Asp Gly Arg Ser Ala Arg Gly Gly Cys 115 120 125

Gln	Thr 130	Ser	Asn	Asp	Ala	Ala 135	Ala	Glu	Ala	Leu	Asn 140	Ala	Ser	Ser	Lys
Glu 145	Glu	Ala	Leu	Gln	Ile 150	Ile	Arg	Glu	Lys	Ile 155	Pro	Glu	Lys	Tyr	Leu 160
Phe	Gln	Phe	His	Asn 165	Leu	Asn	Ser	Asn	Leu 170	Asp	Arg	Ile	Phe	Asp 175	Lys
Thr	Pro	Glu	Pro 180	Trp	Leu	Pro	Pro	Phe 185	His	Val	Ser	Ser	Phe 190	Thr	Asn
Val	Pro	Asp 195		Met	Arg	Gln	Trp 200	Ala	Glu	Asn	Tyr	Phe 205	Gly	Lys	Ser
Ser	Ala 210		Arg	Pro	Glu	Arg 215	Pro	Ile	Ser	Ile	Ile 220	Ile	Glu	Gly	Asp
Ser 225		Thr	Gly	. Lys	Thr 230	Met	Trp	Ala	Arg	Ser 235	Leu	Gly	Pro	His	Asn 240
Tyr	Leu	Ser	Gly	His 245	Leu	Asp	Leu	Asn	Ser 250	Arg	Val	Tyr	Ser	Asn 255	Lys
Val	. Glu	. Туг	Asn 260		. Ile	Asp	Asp	Val 265	Thr	Pro	Gln	Tyr	Leu 270	Lys	Leu
Lys	His	275	_	s Glu	ı Leu	ı Ile	e Gly 280		Gln	Arg	Asp	Trp 285	Gln	Thr	Asn
Cys	5 Lys 290		r Gly	y Lys	B Pro	Val 295	l Glr	ı Ile	. Lys	s Gly	Gly 300	Ile	Pro	Ser	Ile
Va. 30!		і Су	s Ası	n Pro	Gly 310		ı Gly	/ Ala	. Ser	Tyr 315	Lys	Val	. Phe	e Lev	320
Ly:	s Gl	u Gl	u Ası	n Th:		o Lei	ı Ly:	s Asr	1 Tr <u>r</u> 330	o Thi	r Ph∈	His	s Asr	335	Lys
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Ser Lys Glu Glu Ala Leu Gln Ile Ile Arg Glu Lys Ile Pro Glu Lys
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<223> E--N140 + KEE146 (Ala4+5) mutation

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Tyr Leu Phe Gln Phe His Asn Leu Asn Ser Asn Leu Asp Arg Ile Phe 50 55 60

Asp Lys Thr Pro Glu Pro 65 70

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Tyr Leu Phe Gln Phe His Asn Leu Asn Ser Asn Leu Asp Arg Ile Phe 50 55 60

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Ser Lys Glu Glu Ala Leu Gln Ile Ile Arg Glu Lys Ile Pro Glu Lys
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<223> QT130 (Ala2) mutation

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Gly Cys Ala Ala Ser Asn Asp Ala Ala Ala Glu Ala Leu Asn Ala Ser 20 25 30

Ser Lys Glu Glu Ala Leu Gln Ile Ile Arg Glu Lys Ile Pro Glu Lys 35 40 45

Tyr Leu Phe Gln Phe His Asn Leu Asn Ser Asn Leu Asp Arg Ile Phe 50 55 60

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<223> ND133 (Ala3) mutation

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Ser Lys Glu Glu Ala Leu Gln Ile Ile Arg Glu Lys Ile Pro Glu Lys 35 40 45

Tyr Leu Phe Gln Phe His Asn Leu Asn Ser Asn Leu Asp Arg Ile Phe 50 55 60

Asp Lys Thr Pro Glu Pro 65 70

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Ser Lys Glu Glu Ala Leu Gln Ile Ile Arg Glu Lys Ile Pro Glu Lys 35 40 45

Tyr Leu Phe Gln Phe His Asn Leu Asn Ser Asn Leu Asp Arg Ile Phe 50 55 60

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<223> KEE146 (Ala5) mutation

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Ser Ala Ala Ala Leu Gln Ile Ile Arg Glu Lys Ile Pro Glu Lys 35 40 45

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Gly Cys Gln Thr Ser Asn Asp Ala Ala Ala Glu Ala Leu Asn Ala Ser 20 25 30

Ser Lys Glu Glu Ala Leu Gln Ile Ile Arg Glu Lys Ile Pro Glu Lys
35 40 45

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Ser Lys Glu Ala Ala Leu Gln Ile Ile Arg Glu Lys Ile Pro Glu Lys 35 40 45

Tyr Leu Phe Gln Phe His Asn Leu Asn Ser Asn Leu Asp Arg Ile Phe 50 55 60

Asp Lys Thr Pro Glu Pro 65 70

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Ser Lys Ala Ala Ala Leu Gln Ile Ile Arg Glu Lys Ile Pro Glu Lys 35 40 45

Tyr Leu Phe Gln Phe His Asn Leu Asn Ser Asn Leu Asp Arg Ile Phe 50 55 60

Asp Lys Thr Pro Glu Pro 65 70

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Ser Lys Glu Glu Ala Ala Gln Ile Ile Arg Glu Lys Ile Pro Glu Lys
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Tyr Leu Phe Gln Phe His Asn Leu Asn Ser Asn Leu Asp Arg Ile Phe 50 55 60

Asp Lys Thr Pro Glu Pro 65 70

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Tyr Leu Phe Gln Phe His Asn Leu Asn Ser Asn Leu Asp Arg Ile Phe 50 55 60

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Ser Lys Glu Glu Ala Leu Gln Ala Ala Arg Glu Lys Ile Pro Glu Lys 35 40 45

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Asp Lys Thr Pro Glu Pro 65 70

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gtcaagacgt	acatcgacaa	agacggagat	actcttgtat	ggggagaatt	ccaggtcgac	360
ggtcgaagtg	ctagaggagg	ttgccaaaca	tctaacgacg	ctgcagcaga	ggcgttaaat	420
gcttcttcca	aagaagaagc	cctgcagata	attagagaga	aaatcccaga	aaaatattta	480
tttcagttcc	acaatctaaa	tagcaattta	gataggatat	ttgataagac	tcctgaacca	540
tggetteete	cgttccacgt	ctcatcattt	actaacgtgc	cagacgagat	gagacaatgg	600
gctgaaaatt	attttggaaa	gagttccgct	gcgcggccgg	agagacctat	tagtattatc	660
atcgagggcg	atagtcggac	gggaaagact	atgtgggctc	gttcactagg	cccacataat	720
tatttgagcg	ggcatttgga	tctcaattct	agggtttact	caaacaaggt	tgagtataac	780
gtcatcgatg	atgtcacacc	gcaatatcta	aagttgaaac	attggaaaga	actcattggg	840
gcccaaagag	attggcagac	taactgtaaa	tacggaaagc	cagttcaaat	taaaggaggt	900
atcccgtcaa	tcgtgctgtg	caatcctgga	gagggtgcta	gctataaagt	tttcctcgac	960
aaagaggaaa	acactccact	aaagaactgg	actttccata	atgcgaaatt	cgtcttcctc	1020
aactccccc	tctatcaaag	ctcaacacag	agcagc			1056

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- <211> 1056
- <212> DNA
- <213> Tomato golden mosaic virus
- <220>
- <221> CDS
- <222> (1)..(1056)
- <223> TGMV AL1 FQ118 mutant (Ala13)

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ctt ac Leu T		Гуr								96
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aga g Arg G	lu 1									192
ttc g Phe G 65										240
tcc c Ser P										288
tcg t Ser S										336
gta t Val T	rp (									384
caa a Gln T										432
gaa g Glu G 145										480
ttt c Phe G										528
act c Thr P										576
gtg c Val P	ro .									624
tcc g Ser A 2										672

agt cgg acg gga Ser Arg Thr Gly 225		Trp Ala Arg		
tat ttg agc ggg Tyr Leu Ser Gly				
gtt gag tat aac Val Glu Tyr Asn 260	-		-	
aaa cat tgg aaa Lys His Trp Lys 275	_			
tgt aaa tac gga Cys Lys Tyr Gly 290	-	•	gga ggt atc ccg Gly Gly Ile Pro 300	
gtg ctg tgc aat Val Leu Cys Asn 305		Gly Ala Ser	·=	
aaa gag gaa aac Lys Glu Glu Asn			act ttc cat aat Thr Phe His Asn	<del>-</del> -
_			agc tca aca cag Ser Ser Thr Gln 350	
<210> 52 <211> 352 <212> PRT <213> Tomato go	olden mosaic	virus		
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Leu Thr Tyr Pro 20	Gln Cys Ser	Leu Ser Lys	Glu Glu Ser Leu 30	Ser Gln
Leu Gln Ala Leu 35	Asn Thr Pro	Ile Asn Lys	Lys Phe Ile Lys 45	Ile Cys
Arg Glu Leu His 50	Glu Asp Gly 55	Gln Pro His	Leu His Val Leu 60	Ile Gln

Phe Glu Gl 65	y Lys Tyr	Cys Cys 70	Gln Asr	n Gln Arg 75	y Phe Ph	e Asp 1	Leu Val 80
Ser Pro Th	r Arg Ser 85	Ala His	Phe His	90 Pro Asr	ı Ile Gl	_	Ala Lys 95
Ser Ser Se	r Asp Val 100	Lys Thr	Tyr Ile		Asp Gl	y Asp '	Thr Leu
Val Trp Gl 11	-	Ala Val	Asp Gly	/ Arg Sei	Ala Ar 12		Gly Cys
Gln Thr Se	r Asn Asp	Ala Ala 135		ı Ala Leı	ı Asn Al 140	a Ser	Ser Lys
Glu Glu Al 145	a Leu Gln	Ile Ile 150	Arg Glı	ı Lys Ile 159		u Lys '	Tyr Leu 160
Phe Gln Ph	e His Asn 165		Ser Asr	ı Leu As <u>r</u> 170	Arg I		Asp Lys 175
Thr Pro Gl	u Pro Trp 180	Leu Pro	Pro Phe		l Ser S€	er Phe '	Thr Asn
Val Pro As	-	Arg Gln	Trp Ala	a Glu Asr	n Tyr Ph 20		Lys Ser
Ser Ala Al 210	a Arg Pro	Glu Arg 215		e Ser Ile	e Ile Il 220	e Glu (	Gly Asp
Ser Arg Th	r Gly Lys	Thr Met 230	Trp Ala	a Arg Sen 235		y Pro 1	His Asn 240
Tyr Leu Se	r Gly His 245	_	Leu Ası	ser Arg 250	y Val Ty		Asn Lys 255
Val Glu Ty	r Asn Val 260	Ile Asp	Asp Val		Gln Ty	r Leu 1 270	Lys Leu
Lys His Tr 27		Leu Ile	Gly Ala 280	a Gln Arg	g Asp Tr 28		Thr Asn
Cys Lys Ty	r Gly Lys	Pro Val	Gln Ile	Lys Gly	Gly I	e Pro	Ser Ile

290	295	300

Val Leu Cys Asn Pro Gly Glu Gly Ala Ser Tyr Lys Val Phe Leu Asp 305 310 315 320	
Lys Glu Glu Asn Thr Pro Leu Lys Asn Trp Thr Phe His Asn Ala Lys 325 330 335	
Phe Val Phe Leu Asn Ser Pro Leu Tyr Gln Ser Ser Thr Gln Ser Ser 340 345 350	
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<220> <221> CDS <222> (1)(1056) <223> TGMV AL1 D120 (Ala14) mutant	
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ctt aca tat cct cag tgc tcc ttg tcc aaa gaa gaa tca ctt tct caa Leu Thr Tyr Pro Gln Cys Ser Leu Ser Lys Glu Glu Ser Leu Ser Gln 20 25 30	96
tta caa gcc cta aac act ccg att aac aaa ata ttc ata aaa atc tgc Leu Gln Ala Leu Asn Thr Pro Ile Asn Lys Lys Phe Ile Lys Ile Cys 35 40 45	L <b>44</b>
aga gag ctt cat gaa gat ggg caa cct cac ctc cac gtg ctt att cag Arg Glu Leu His Glu Asp Gly Gln Pro His Leu His Val Leu Ile Gln 50 55 60	L92
ttc gag gga aaa tac tgc tgc caa aat caa cga ttc ttc gac ctg gta  Phe Glu Gly Lys Tyr Cys Cys Gln Asn Gln Arg Phe Phe Asp Leu Val  65 70 75 80	240
tcc cca aca agg tca gca cat ttc cat cca aac att cag aga gct aaa Ser Pro Thr Arg Ser Ala His Phe His Pro Asn Ile Gln Arg Ala Lys 85 90 95	88
tcg tct tcc gac gtc aag acg tac atc gac aaa gac gga gat act ctt Ser Ser Ser Asp Val Lys Thr Tyr Ile Asp Lys Asp Gly Asp Thr Leu 100 105 110	36
gta tgg gga gaa gcc gcg gtc gcc ggc cga agt gct aga gga ggt tgc Val Trp Gly Glu Ala Ala Val Ala Gly Arg Ser Ala Arg Gly Gly Cys	884

115	120	125

	aca Thr 130														432
_	gaa Glu														480
	cag Gln					_			_				_	_	528
	cct Pro	_				_			-						576
	cca Pro							-							624
	gct Ala 210	-	 _		_			_				~ -		-	672
_	cgg Arg	_	 _		_	~ ~	_	_							720
	ttg Leu	_		_	_					_				-	768
_	gag Glu		_		_	_			_					_	816
	cat His														864
	aaa Lys 290														912
	ctg Leu	_					_	_			_			_	960
	gag Glu	-				_							~ ~		1008
	gtc Val								_			_	-	_	1056

<210> 54

<211> 352

<212> PRT

<213> Tomato golden mosaic virus

<400> 54

Met Pro Ser His Pro Lys Arg Phe Gln Ile Asn Ala Lys Asn Tyr Phe 1 5 10 15

Leu Thr Tyr Pro Gln Cys Ser Leu Ser Lys Glu Glu Ser Leu Ser Gln 20 25 30

Leu Gln Ala Leu Asn Thr Pro Ile Asn Lys Lys Phe Ile Lys Ile Cys 35 40 45

Arg Glu Leu His Glu Asp Gly Gln Pro His Leu His Val Leu Ile Gln 50 55 60

Phe Glu Gly Lys Tyr Cys Cys Gln Asn Gln Arg Phe Phe Asp Leu Val 65 70 75 80

Ser Pro Thr Arg Ser Ala His Phe His Pro Asn Ile Gln Arg Ala Lys 85 90 95

Ser Ser Ser Asp Val Lys Thr Tyr Ile Asp Lys Asp Gly Asp Thr Leu 100 105 110

Val Trp Gly Glu Ala Ala Val Ala Gly Arg Ser Ala Arg Gly Gly Cys 115 120 125

Gln Thr Ser Asn Asp Ala Ala Ala Glu Ala Leu Asn Ala Ser Ser Lys 130 135 140

Glu Glu Ala Leu Gln Ile Ile Arg Glu Lys Ile Pro Glu Lys Tyr Leu 145 150 155 160

Phe Gln Phe His Asn Leu Asn Ser Asn Leu Asp Arg Ile Phe Asp Lys 165 170 175

Thr Pro Glu Pro Trp Leu Pro Pro Phe His Val Ser Ser Phe Thr Asn 180 185 190

Val	Pro	Asp 195	Glu	Met	Arg	Gln	Trp 200	Ala	Glu	Asn	Tyr	Phe 205	Gly	Lys	Ser	
Ser	Ala 210	Ala	Arg	Pro	Glu	Arg 215	Pro	Ile	Ser	Ile	Ile 220	Ile	Glu	Gly	Asp	
Ser 225	Arg	Thr	Gly	Lys	Thr 230	Met	Trp	Ala	Arg	Ser 235	Leu	Gly	Pro	His	Asn 240	
Tyr	Leu	Ser	Gly	His 245	Leu	Asp	Leu	Asn	Ser 250	Arg	Val	Tyr	Ser	Asn 255	Lys	
Val	Glu	Tyr	Asn 260		Ile	Asp	Asp	Val 265	Thr	Pro	Gln	Tyr	Leu 270	Lys	Leu	
Lys	His	Trp 275		Glu	Leu	Ile	Gly 280	Ala	Gln	Arg	Asp	Trp 285	Gln	Thr	Asn	
Cys	Lys 290		Gly	Lys	Pro	Val 295		. Ile	Lys	Gly	Gly 300	Ile	Pro	Ser	Ile	
Val		. Cys	. Asn	Pro	Gly 310		Gly	Ala	Ser	Туг 315	Lys	Val	. Phe	Leu	Asp 320	
Lys	s Glu	ı Glu	ı Asn	Thr 325		Leu	Lys	s Asn	330	Thr	Phe	e His	s Asn	Ala 335	Lys	
Phe	e Val	l Phe	e Leu 340		n Ser	Pro	Let	1 Tyr 345	Glr	n Sei	s Ser	Thi	Glr 350	n Ser	: Ser	
<2: <2:	10> 11> 12> 13>			golde	en mo	osaid	e vi:	rus								
<2 <2	20> 21> 22> 23>	CDS (1) TGM	(1) V AL:	056) 1 RS	-R12!	5 (A	la1)	muta	ant							
- +	00> g cc t Pr	a to	g ca r Hi	t cc s Pr	a aaa o Lya	a cg	g tt g Ph	t ca e Gl:	a atan Il	e As	t gc n Al	c aa a Ly	a aa s As:	t ta n Ty 15	t ttt r Phe	48
	t ac	a ta	t cc	t ca	g tg	c tc	c tt	g tc	c aa	a ga	a ga	a tc	a ct	t tc	t caa	96

Leu	Thr	Tyr	Pro 20	Gln	Cys	Ser	Leu	Ser 25	Lys	Glu	Glu	Ser	Leu 30	Ser	Gln	
		_									ttc Phe					144
_				_	_						cac His 60				_	192
											ttc Phe					240
											att Ile					288
_			_	_	_	_			_		gac Asp		_			336
-			_		_	_	_			_	gct Ala	_			_	384
				_	_	-	_				aat Asn 140					432
-	-	_	_	_			_				cca Pro					480
											agg Arg					528
		_					_			-	tca Ser					576
											tat Tyr					624
											atc Ile 220					672
											cta Leu					<b>720</b>
											gtt Val					768

		•			245					250					255		
_					_	atc Ile	_	_	-		_				_	_	816
						ctc Leu											864
-					-	cca Pro	_							_			912
	al					gga Gly 310											960
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						tcc Ser					_			_	-	_	1056
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<2 <2 <2 <4	211 212 213	L> 3 2> I 3> 7	352 PRT Fomat			n mos Lys				Ile 10	Asn	Ala	Lys	Asn	Tyr 15	Phe	
<2 <2 <2 <4 Me 1	211 212 213 400 et	l> 3 ?> I 3> 7 ?> 5 Pro	352 PRT Tomat 56 Ser	His	Pro 5		Arg	Phe	Gln	10			-		15		
<2 <2 <2 <4 Metal Let	211 212 213 213 400 et	>   3  >   1  3>   3  >   9   Pro	352 PRT Tomat 56 Ser Tyr	His Pro 20	Pro 5 Gln	Lys	Arg Ser	Phe Leu	Gln Ser 25	10 Lys	Glu	Glu	Ser	Leu 30	15 Ser	Gln	
<2 <2 <2 <4 Metal Let	211 212 213 100 et	2> 1 3> 7 9> 9 Pro Thr	352 PRT Fomat 56 Ser Tyr Ala 35	His Pro 20	Pro 5 Gln Asn	Lys Cys	Arg Ser Pro	Phe Leu Ile 40	Gln Ser 25 Asn	10 Lys	Glu Lys	Glu Phe	Ser Ile 45	Leu 30 Lys	15 Ser Ile	Gln Cys	
<2 <2 <2 <4 <4 <4 <4 <4 <4 <4 <4 <4 <4 <4 <4 <4	211 212 213 400 et	Pro Thr Gln Glu 50	352 PRT Fomat 56 Ser Tyr Ala 35	His Pro 20 Leu	Pro 5 Gln Asn Glu	Lys Cys Thr	Arg Ser Pro Gly 55	Phe Leu Ile 40 Gln	Gln Ser 25 Asn	10 Lys Lys His	Glu Lys Leu	Glu Phe His	Ser Ile 45 Val	Leu 30 Lys Leu	Ser Ile	Gln Cys Gln	

Ser Pro Thr Arg Ser Ala His Phe His Pro Asn Ile Gln Arg Ala Lys

ser	ser	ser	100	vai	гÀг	Thr	Tyr	11e 105	Asp	гÀг	Asp	GTA	110	Tnr	ьeu
Val	Trp	Gly 115	Glu	Phe	Gln	Val	Asp 120	Gly	Ala	Ala	Ala	Ala 125	Gly	Gly	Cys
Gln	Thr 130	Ser	Asn	Asp	Ala	Ala 135	Ala	Glu	Ala	Leu	Asn 140	Ala	Ser	Ser	Lys
Glu 145	Glu	Ala	Leu	Gln	Ile 150	Ile	Arg	Glu	Lys	Ile 155	Pro	Glu	Lys	Tyr	Leu 160
Phe	Gln	Phe	His	Asn 165	Leu	Asn	Ser	Asn	Leu 170	Asp	Arg	Ile	Phe	Asp 175	Lys
Thr	Pro	Glu	Pro 180	Trp	Leu	Pro	Pro	Phe 185	His	Val	Ser	Ser	Phe 190	Thr	Asn
Val	Pro	Asp 195	Glu	Met	Arg	Gln	Trp 200	Ala	Glu	Asn	Tyr	Phe 205	Gly	Lys	Ser
Ser	Ala 210	Ala	Arg	Pro	Glu	Arg 215	Pro	Ile	Ser	Ile	Ile 220	Ile	Glu	Gly	Asp
Ser 225	Arg	Thr	Gly	Lys	Thr 230	Met	Trp	Ala	Arg	Ser 235	Leu	Gly	Pro	His	Asn 240
Tyr	Leu	Ser	Gly	His 245	Leu	Asp	Leu	Asn	Ser 250	Arg	Val	Tyr	Ser	Asn 255	Lys
Val	Glu	Tyr	Asn 260	Val	Ile	Asp	Asp	Val 265	Thr	Pro	Gln	Tyr	Leu 270	Lys	Leu
Lys	His	Trp 275	Lys	Glu	Leu	Ile	Gly 280	Ala	Gln	Arg	Asp	Trp 285	Gln	Thr	Asn
Сув	Lys 290	Tyr	Gly	Lys	Pro	Val 295	Gln	Ile	Lys	Gly	Gly 300	Ile	Pro	Ser	Ile
Val	Leu	Cys	Asn	Pro	Gly	Glu	Gly	Ala	Ser	Tyr	Lys	Val	Phe	Leu	Asp

Lys Glu Glu Asn Thr Pro Leu Lys Asn Trp Thr Phe His Asn Ala Lys 325 330 335

Phe Val Phe Leu Asn Ser Pro Leu Tyr Gln Ser Ser Thr Gln Ser Ser 340 345 350

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ctt aca tat cct cag tgc tcc ttg tcc aaa gaa gaa tca ctt tct caa Leu Thr Tyr Pro Gln Cys Ser Leu Ser Lys Glu Glu Ser Leu Ser Gln 20 25 30	96										
tta caa gcc cta aac act ccg att aac aaa aaa ttc ata aaa atc tgc Leu Gln Ala Leu Asn Thr Pro Ile Asn Lys Lys Phe Ile Lys Ile Cys 35 40 45	144										
aga gag ctt cat gaa gat ggg caa cct cac ctc cac gtg ctt att cag Arg Glu Leu His Glu Asp Gly Gln Pro His Leu His Val Leu Ile Gln 50 55 60	192										
ttc gag gga aaa tac tgc tgc caa aat caa cga ttc ttc gac ctg gta Phe Glu Gly Lys Tyr Cys Cys Gln Asn Gln Arg Phe Phe Asp Leu Val 65 70 75 80	240										
tcc cca aca agg tca gca cat ttc cat cca aac att cag aga gct aaa Ser Pro Thr Arg Ser Ala His Phe His Pro Asn Ile Gln Arg Ala Lys 85 90 95	288										
tcg tct tcc gac gtc aag acg tac atc gac aaa gac gga gat act ctt Ser Ser Ser Asp Val Lys Thr Tyr Ile Asp Lys Asp Gly Asp Thr Leu 100 105 110	336										
gta tgg gga gaa ttc cag gtc gac ggt cga agt gct aga gga ggt tgc Val Trp Gly Glu Phe Gln Val Asp Gly Arg Ser Ala Arg Gly Gly Cys 115 120 125	384										
gca gct agc aac gac gct gca gca gag gcg tta aat gct tct tcc aaa Ala Ala Ser Asn Asp Ala Ala Ala Glu Ala Leu Asn Ala Ser Ser Lys 130 135 140	432										
gaa gaa gcc ctg cag ata att aga gag aaa atc cca gaa aaa tat tta	480										

Glu 145	Glu	Ala	Leu	Gln	Ile 150	Ile	Arg	Glu	Lys	Ile 155	Pro	Glu	Lys	Tyr	Leu 160	
	_				cta Leu		_			-				-	_	528
		_			ctt Leu		_									576
					aga Arg											624
					gag Glu											672
_		_		_	act Thr 230	-		-	-							720
	_	_			ttg Leu	-					_				_	768
_				_	atc Ile	_	-	-		-				_	_	816
					ctc Leu											864
					cca Pro											912
					gga Gly 310											960
		_			cca Pro		_									1008
	_				tcc Ser					_			_	_	_	1056

<sup>&</sup>lt;210> 58

<sup>&</sup>lt;211> 352

<sup>&</sup>lt;212> PRT

<sup>&</sup>lt;213> Tomato golden mosaic virus

. 4	$\sim$	^		5.8
-4	11	11	`	~~

Met Pro Ser His Pro Lys Arg Phe Gln Ile Asn Ala Lys Asn Tyr Phe 1 5 10 15

Leu Thr Tyr Pro Gln Cys Ser Leu Ser Lys Glu Glu Ser Leu Ser Gln
20 25 30

Leu Gln Ala Leu Asn Thr Pro Ile Asn Lys Lys Phe Ile Lys Ile Cys
35 40 45

Arg Glu Leu His Glu Asp Gly Gln Pro His Leu His Val Leu Ile Gln
50 55 60

Phe Glu Gly Lys Tyr Cys Cys Gln Asn Gln Arg Phe Phe Asp Leu Val 65 70 75 80

Ser Pro Thr Arg Ser Ala His Phe His Pro Asn Ile Gln Arg Ala Lys 85 90 95

Ser Ser Ser Asp Val Lys Thr Tyr Ile Asp Lys Asp Gly Asp Thr Leu 100 105 110

Val Trp Gly Glu Phe Gln Val Asp Gly Arg Ser Ala Arg Gly Gly Cys 115 120 125

Ala Ala Ser Asn Asp Ala Ala Ala Glu Ala Leu Asn Ala Ser Ser Lys 130 135 140

Glu Glu Ala Leu Gln Ile Ile Arg Glu Lys Ile Pro Glu Lys Tyr Leu 145 150 155 160

Phe Gln Phe His Asn Leu Asn Ser Asn Leu Asp Arg Ile Phe Asp Lys
165 170 175

Thr Pro Glu Pro Trp Leu Pro Pro Phe His Val Ser Ser Phe Thr Asn 180 185 190

Val Pro Asp Glu Met Arg Gln Trp Ala Glu Asn Tyr Phe Gly Lys Ser 195 200 205

Ser Ala Ala Arg Pro Glu Arg Pro Ile Ser Ile Ile Ile Glu Gly Asp 210 215 220

Ser Arg Thr 225		nr Met Trp 30	Ala Arg	Ser Leu 235	Gly Pro	His Asn 240						
Tyr Leu Ser	Gly His Le 245	eu Asp Leu	Asn Ser 250	Arg Val	Tyr Ser	Asn Lys 255						
Val Glu Tyr	Asn Val II	le Asp Asp	Val Thr 265	Pro Gln	Tyr Leu 270	Lys Leu						
Lys His Trp 275	Lys Glu Le	eu Ile Gly 280		Arg Asp	Trp Gln 285	Thr Asn						
Cys Lys Tyr 290	Gly Lys P	ro Val Glm 295	lle Lys	Gly Gly 300	Ile Pro	Ser Ile						
Val Leu Cys 305		ly Glu Gly 10	Ala Ser	Tyr Lys 315	Val Phe	Leu Asp 320						
Lys Glu Glu	Asn Thr Page 325	ro Leu Lys	Asn Trp 330	Thr Phe	His Asn	Ala Lys 335						
Phe Val Phe	Leu Asn So	er Pro Leu	Tyr Gln 345	Ser Ser	Thr Gln 350	Ser Ser						
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					_	_				_			gac Asp	_	_	240
					_							_	aga Arg	_		288
_				_	_	_			_		_		gat Asp 110			336
_			_		_	_	-		_	_	_	_	gga Gly		_	384
				_	-	-	-					_	tct Ser			432
_	_	_	_	_			_					_	aaa Lys			480
	_						_			_			ttt Phe	_	_	528
		_					_			_			ttt Phe 190			576
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													gag Glu			672
_		_		_		_		_	_				cca Pro			720
													tca Ser			768
_				_		-	_	-		_			cta Leu 270	_	_	816
aaa	cat	tgg	aaa	gaa	ctc	att	aaa	gcc	caa	aga	gat	tgg	cag	act	aac	864

Lys His Trp 275	Lys Glu	Leu Ile	Gly Ala 280	Gln Arg	Asp Trp 285	Gln Thr	Asn
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aaa gag gaa Lys Glu Glu							Lys
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Leu Thr Tyr	Pro Gln 20	Cys Ser	Leu Ser 25	Lys Glu	Glu Ser	Leu Ser 30	Gln
Leu Gln Ala 35	Leu Asn	Thr Pro	Ile Asn 40	Lys Lys	Phe Ile 45	Lys Ile	Cys
Arg Glu Leu 50	His Glu	Asp Gly 55	Gln Pro	His Leu	His Val	Leu Ile	Gln
Phe Glu Gly 65	Lys Tyr	Cys Cys 70	Gln Asn	Gln Arg 75	Phe Phe	Asp Leu	Val 80
Ser Pro Thr	Arg Ser 85	Ala His	Phe His	Pro Asn 90	Ile Gln	Arg Ala 95	Lys
Ser Ser Ser	Asp Val	Lys Thr	Tyr Ile 105	Asp Lys	Asp Gly	Asp Thr	Leu

Gln	Thr 130	Ser	Ala	Ala	Ala	Ala 135	Ala	Glu	Ala	Leu	Asn 140	Ala	Ser	Ser	Lys
Glu 145	Glu	Ala	Leu	Gln	Ile 150	Ile	Arg	Glu	Lys	Ile 155	Pro	Glu	Lys	Tyr	Leu 160
Phe	Gln	Phe	His	Asn 165	Leu	Asn	Ser	Asn	Leu 170	Asp	Arg	Ile	Phe	Asp 175	Lys
Thr	Pro	Glu	Pro 180	Trp	Leu	Pro	Pro	Phe 185	His	Val	Ser	Ser	Phe 190	Thr	Asn
Val	Pro	Asp 195	Glu	Met	Arg	Gln	Trp 200	Ala	Glu	Asn	Tyr	Phe 205	Gly	Lys	Ser
Ser	Ala 210	Ala	Arg	Pro	Glu	Arg 215	Pro	Ile	Ser	Ile	Ile 220	Ile	Glu	Gly	Asp
Ser 225	Arg	Thr	Gly	Lys	Thr 230	Met	Trp	Ala	Arg	Ser 235	Leu	Gly	Pro	His	Asn 240
Tyr	Leu	Ser	Gly	His 245	Leu	Asp	Leu	Asn	Ser 250	Arg	Val	Tyr	Ser	Asn 255	Lys
Val	Glu	Tyr	Asn 260	Val	Ile	Asp	Asp	Val 265	Thr	Pro	Gln	Tyr	Leu 270	Lys	Leu
Lys	His	Trp 275	Lys	Glu	Leu	Ile	Gly 280	Ala	Gln	Arg	Asp	Trp 285	Gln	Thr	Asn
Cys	Lys 290	Tyr	Gly	Lys	Pro	Val 295	Gln	Ile	Lys	Gly	Gly 300	Ile	Pro	Ser	Ile
Val 305	Leu	Cys	Asn	Pro	Gly 310	Glu	Gly	Ala	Ser	Tyr 315	Lys	Val	Phe	Leu	Asp 320
Lys	Glu	Glu	Asn	Thr 325	Pro	Leu	Lys	Asn	Trp 330	Thr	Phe	His	Asn	Ala 335	Lys
Phe	Val	Phe	Leu 340	Asn	Ser	Pro	Leu	Tyr 345	Gln	Ser	Ser	Thr	Gln 350	Ser	Ser

<210> 61 <211> 1056 <212> DNA <213> Tomato golden mosaic virus	
<220> <221> CDS <222> (1)(1056) <223> TGMV AL1 EN140 (Ala4) mutant	
<pre>&lt;400&gt; 61 atg cca tcg cat cca aaa cgg ttt caa ata aat gcc aaa aat tat ttt Met Pro Ser His Pro Lys Arg Phe Gln Ile Asn Ala Lys Asn Tyr Phe 1 5 10 15</pre>	48
ctt aca tat cct cag tgc tcc ttg tcc aaa gaa gaa tca ctt tct caa Leu Thr Tyr Pro Gln Cys Ser Leu Ser Lys Glu Glu Ser Leu Ser Gln 20 25 30	96
tta caa gcc cta aac act ccg att aac aaa aaa ttc ata aaa atc tgc Leu Gln Ala Leu Asn Thr Pro Ile Asn Lys Lys Phe Ile Lys Ile Cys 35 40 45	144
aga gag ctt cat gaa gat ggg caa cct cac ctc cac gtg ctt att cag Arg Glu Leu His Glu Asp Gly Gln Pro His Leu His Val Leu Ile Gln 50 55 60	192
ttc gag gga aaa tac tgc tgc caa aat caa cga ttc ttc gac ctg gta Phe Glu Gly Lys Tyr Cys Cys Gln Asn Gln Arg Phe Phe Asp Leu Val 65 70 75 80	240
tcc cca aca agg tca gca cat ttc cat cca aac att cag aga gct aaa Ser Pro Thr Arg Ser Ala His Phe His Pro Asn Ile Gln Arg Ala Lys 85 90 95	288
tcg tct tcc gac gtc aag acg tac atc gac aaa gac gga gat act ctt Ser Ser Ser Asp Val Lys Thr Tyr Ile Asp Lys Asp Gly Asp Thr Leu 100 105 110	336
gta tgg gga gaa ttc cag gtc gac ggt cga agt gct aga gga ggt tgc Val Trp Gly Glu Phe Gln Val Asp Gly Arg Ser Ala Arg Gly Gly Cys 115 120 125	384
caa aca tct aac gac gct gca gcg gcc gcg tta gct gct tct tcc aaa Gln Thr Ser Asn Asp Ala Ala Ala Ala Ala Leu Ala Ala Ser Ser Lys 130 135 140	432
gaa gaa gcc ctg cag ata att aga gag aaa atc cca gaa aaa tat tta Glu Glu Ala Leu Gln Ile Ile Arg Glu Lys Ile Pro Glu Lys Tyr Leu 145 150 155	480
ttt cag ttc cac aat cta aat agc aat tta gat agg ata ttt gat aag Phe Gln Phe His Asn Leu Asn Ser Asn Leu Asp Arg Ile Phe Asp Lys 165 170 175	528

										tca Ser					576
		_	 _	_			-	_		tat Tyr			_	_	624
	_		 _		_			_		atc Ile 220			-	_	672
_			 _		_		_	_		cta Leu					720
										gtt Val					768
_			_		_	_	_		_	caa Gln			_	_	816
										gat Asp		_			864
										ggt Gly 300					912
_				_			-	_		aaa Lys	_			-	960
		_				_				ttc Phe					1008
	_								_	tca Ser		_	_	_	1056

<210> 62

<211> 352

<212> PRT

<213> Tomato golden mosaic virus

<400> 62

Met Pro Ser His Pro Lys Arg Phe Gln Ile Asn Ala Lys Asn Tyr Phe 1 5 10 10 15

Leu Thr Tyr Pro Gln Cys Ser Leu Ser Lys Glu Glu Ser Leu Ser Gln

20 25 30

Leu	Gln	Ala	Leu	Asn	Thr	Pro	He	Asn	Lys	Lys	Phe	Ile	Lys	Ile	Cys
		35					40					45			

- Arg Glu Leu His Glu Asp Gly Gln Pro His Leu His Val Leu Ile Gln 50 60
- Phe Glu Gly Lys Tyr Cys Cys Gln Asn Gln Arg Phe Phe Asp Leu Val 65 70 75 80
- Ser Pro Thr Arg Ser Ala His Phe His Pro Asn Ile Gln Arg Ala Lys 85 90 95
- Ser Ser Ser Asp Val Lys Thr Tyr Ile Asp Lys Asp Gly Asp Thr Leu 100 105 110
- Val Trp Gly Glu Phe Gln Val Asp Gly Arg Ser Ala Arg Gly Gly Cys 115 120 125
- Gln Thr Ser Asn Asp Ala Ala Ala Ala Ala Leu Ala Ala Ser Ser Lys 130 135 140
- Glu Glu Ala Leu Gln Ile Ile Arg Glu Lys Ile Pro Glu Lys Tyr Leu 145 150 155 160
- Phe Gln Phe His Asn Leu Asn Ser Asn Leu Asp Arg Ile Phe Asp Lys 165 170 175
- Thr Pro Glu Pro Trp Leu Pro Pro Phe His Val Ser Ser Phe Thr Asn 180 185 190
- Val Pro Asp Glu Met Arg Gln Trp Ala Glu Asn Tyr Phe Gly Lys Ser 195 200 205
- Ser Ala Ala Arg Pro Glu Arg Pro Ile Ser Ile Ile Glu Gly Asp 210 215 220
- Ser Arg Thr Gly Lys Thr Met Trp Ala Arg Ser Leu Gly Pro His Asn 225 230 235 240
- Tyr Leu Ser Gly His Leu Asp Leu Asn Ser Arg Val Tyr Ser Asn Lys 245 250 255

Lys His Trp Lys Glu Leu Ile Gly Ala Gln Arg Asp Trp Gln Thr Asn 275 280 285	
Cys Lys Tyr Gly Lys Pro Val Gln Ile Lys Gly Gly Ile Pro Ser Ile 290 295 300	
Val Leu Cys Asn Pro Gly Glu Gly Ala Ser Tyr Lys Val Phe Leu Asp 305 310 315 320	
Lys Glu Glu Asn Thr Pro Leu Lys Asn Trp Thr Phe His Asn Ala Lys 325 330 335	
Phe Val Phe Leu Asn Ser Pro Leu Tyr Gln Ser Ser Thr Gln Ser Ser 340 345 350	
<210> 63 <211> 1056 <212> DNA <213> Tomato golden mosaic virus	
<220> <221> CDS <222> (1)(1056) <223> TGMV AL1 KEE146 (Ala5) mutant	
<221> CDS <222> (1)(1056)	48
<221> CDS <222> (1)(1056) <223> TGMV AL1 KEE146 (Ala5) mutant  <400> 63 atg cca tcg cat cca aaa cgg ttt caa ata aat gcc aaa aat tat ttt Met Pro Ser His Pro Lys Arg Phe Gln Ile Asn Ala Lys Asn Tyr Phe	<b>4</b> 8 96
<pre>&lt;221&gt; CDS &lt;222&gt; (1)(1056) &lt;223&gt; TGMV AL1 KEE146 (Ala5) mutant  &lt;400&gt; 63 atg cca tcg cat cca aaa cgg ttt caa ata aat gcc aaa aat tat ttt Met Pro Ser His Pro Lys Arg Phe Gln Ile Asn Ala Lys Asn Tyr Phe 1</pre>	
<pre>&lt;221&gt; CDS &lt;222&gt; (1)(1056) &lt;223&gt; TGMV AL1 KEE146 (Ala5) mutant  &lt;400&gt; 63 atg cca tcg cat cca aaa cgg ttt caa ata aat gcc aaa aat tat ttt Met Pro Ser His Pro Lys Arg Phe Gln Ile Asn Ala Lys Asn Tyr Phe 1</pre>	96

											att Ile					288
			_	_	_	_			_		gac Asp		_			336
											gct Ala					384
				-	-	-	-				aat Asn 140	-				432
_		_	_	_			_				cca Pro	_				480
	_						_			_	agg Arg			_	_	528
		_					_			-	tca Ser					576
											tat Tyr					624
											atc Ile 220					672
_		_	-	_	Thr	atg Met		_	_		cta Leu					720
					230					235					240	
	_	_			ttg	_				agg	gtt Val				aag	768
Tyr gtt	Leu	Ser	Gly	His 245 gtc	ttg Leu atc	Asp	Leu gat	Asn gtc	Ser 250 aca	agg Arg ccg	gtt	Tyr tat	Ser cta	Asn 255 aag	aag Lys ttg	768 816
Tyr gtt Val	Leu gag Glu cat	Ser tat Tyr	Gly aac Asn 260 aaa	His 245 gtc Val gaa	ttg Leu atc Ile	Asp gat Asp	Leu gat Asp	Asn gtc Val 265 gcc	Ser 250 aca Thr	agg Arg ccg Pro	gtt Val caa	Tyr tat Tyr tgg	cta Leu 270	Asn 255 aag Lys act	aag Lys ttg Leu aac	

gtg ctg tgc aat co Val Leu Cys Asn P 305				960
aaa gag gaa aac a Lys Glu Glu Asn T 3				1008
ttc gtc ttc ctc as Phe Val Phe Leu A 340	sn Ser Pro Leu	_		1056
<210> 64 <211> 352 <212> PRT <213> Tomato gold	den mosaic viru	ıs		
<400> 64			•	
Met Pro Ser His P 1 5	ro Lys Arg Phe	Gln Ile Asn Ala 1	Lys Asn Tyr Phe 15	
Leu Thr Tyr Pro G	•	Ser Lys Glu Glu 8 25	Ser Leu Ser Gln 30	
Leu Gln Ala Leu A 35	sn Thr Pro Ile 40		Ile Lys Ile Cys 45	
Arg Glu Leu His G	lu Asp Gly Gln 55	Pro His Leu His V	Val Leu Ile Gln	
Phe Glu Gly Lys T	yr Cys Cys Gln 70	Asn Gln Arg Phe 1	Phe Asp Leu Val 80	
Ser Pro Thr Arg Se		His Pro Asn Ile (	Gln Arg Ala Lys 95	
Ser Ser Ser Asp Vo		Ile Asp Lys Asp (	Gly Asp Thr Leu 110	
Val Trp Gly Glu Pi 115	he Gln Val Asp 120	-	Arg Gly Gly Cys	
Gln Thr Ser Asn A	sp Ala Ala Ala 135	Glu Ala Leu Asn A	Ala Ser Ser Ala	

Ala Ala Ala Leu Gln Ile Ile Arg Glu Lys Ile Pro Glu Lys Tyr Leu

145	150	155	160

Phe Gln Phe His Asn Leu Asn Ser Asn Leu Asp Arg Ile Phe Asp Lys
165 170 175

Thr Pro Glu Pro Trp Leu Pro Pro Phe His Val Ser Ser Phe Thr Asn 180 185 190

Val Pro Asp Glu Met Arg Gln Trp Ala Glu Asn Tyr Phe Gly Lys Ser 195 200 205

Ser Ala Ala Arg Pro Glu Arg Pro Ile Ser Ile Ile Ile Glu Gly Asp 210 215 220

Ser Arg Thr Gly Lys Thr Met Trp Ala Arg Ser Leu Gly Pro His Asn 225 230 235 240

Tyr Leu Ser Gly His Leu Asp Leu Asn Ser Arg Val Tyr Ser Asn Lys 245 250 255

Val Glu Tyr Asn Val Ile Asp Asp Val Thr Pro Gln Tyr Leu Lys Leu 260 265 270

Lys His Trp Lys Glu Leu Ile Gly Ala Gln Arg Asp Trp Gln Thr Asn 275 280 285

Cys Lys Tyr Gly Lys Pro Val Gln Ile Lys Gly Gly Ile Pro Ser Ile 290 295 300

Val Leu Cys Asn Pro Gly Glu Gly Ala Ser Tyr Lys Val Phe Leu Asp 305 310 315 320

Lys Glu Glu Asn Thr Pro Leu Lys Asn Trp Thr Phe His Asn Ala Lys 325 330 335

Phe Val Phe Leu Asn Ser Pro Leu Tyr Gln Ser Ser Thr Gln Ser Ser 340 345 350

<210> 65

<211> 1056

<212> DNA

<213> Tomato golden mosaic virus

<220 <220 <220 <220	L> ( 2> (				L5 <b>4</b>	(Alaé	5) mi	ıtant	;			,		
	)> 6 cca Pro													48
	aca Thr													96
	caa Gln	_				_								144
	gag Glu 50													192
	gag Glu													240
	cca Pro													288
	tct Ser													336
_	tgg Trp		-		_	_	_		_	_	_	_		384
	aca Thr 130			_	-	_	-							432
	gaa Glu													480
	cag Gln													528
	cct Pro													576
	cca Pro													624

tcc gct gcg cgg ( Ser Ala Ala Arg : 210				
agt cgg acg gga s Ser Arg Thr Gly : 225			Leu Gly Pro	
tat ttg agc ggg t Tyr Leu Ser Gly				
gtt gag tat aac y Val Glu Tyr Asn 260	-			
aaa cat tgg aaa Lys His Trp Lys 275	Glu Leu Ile			
tgt aaa tac gga Cys Lys Tyr Gly 290	-			
gtg ctg tgc aat Val Leu Cys Asn 305			Lys Val Phe	
aaa gag gaa aac Lys Glu Glu Asn				
ttc gtc ttc ctc. Phe Val Phe Leu 340		_		
<210> 66 <211> 352 <212> PRT <213> Tomato go	lden mosaic	virus	,	
<400> 66				
Met Pro Ser His 1	Pro Lys Arg 5	Phe Gln Ile Asr 10	n Ala Lys Asn	Tyr Phe 15
Leu Thr Tyr Pro	Gln Cys Ser	Leu Ser Lys Glu 25	ı Glu Ser Leu 30	Ser Gln
Leu Gln Ala Leu 35		Ile Asn Lys Lys	Phe Ile Lys 45	Ile Cys

Arg	Glu 50	Leu	His	Glu	Asp	Gly 55	Gln	Pro	His	Leu	His 60	Val	Leu	Ile	Gln
Phe 65	Glu	Gly	Lys	Tyr	Cys 70	Cys	Gln	Asn	Gln	Arg 75	Phe	Phe	Asp	Leu	Val 80
Ser	Pro	Thr	Arg	Ser 85	Ala	His	Phe	His	Pro 90	Asn	Ile	Gln	Arg	Ala 95	Lys
Ser	Ser	Ser	Asp 100	Val	Lys	Thr	Tyr	Ile 105	Asp	Lys	Asp	Gly	Asp 110	Thr	Leu
Val	Trp	Gly 115	Glu	Phe	Gln	Val	Asp 120	Gly	Arg	Ser	Ala	Arg 125	Gly	Gly	Cys
Gln	Thr 130	Ser	Asn	Asp	Ala	Ala 135	Ala	Glu	Ala	Leu	Asn 140	Ala	Ser	Ser	Lys
Glu 145	Glu	Ala	Leu	Gln	Ile 150	Ile	Ala	Ala	Ala	Ile 155	Pro	Glu	Lys	Tyr	Leu 160
Phe	Gln	Phe	His	Asn 165	Leu	Asn	Ser	Asn	Leu 170	Asp	Arg	Ile	Phe	Asp 175	Lys
Thr	Pro	Glu	Pro 180	Trp	Leu	Pro	Pro	Phe 185	His	Val	Ser	Ser	Phe 190	Thr	Asn
Val	Pro	Asp 195	Glu	Met	Arg	Gln	Trp 200	Ala	Glu	Asn	Tyr	Phe 205	Gly	Lys	Ser
Ser	Ala 210	Ala	Arg	Pro	Glu	Arg 215	Pro	Ile	Ser	Ile	Ile 220	Ile	Glu	Gly	Asp
Ser 225	Arg	Thr	Gly	Lys	Thr 230	Met	Trp	Ala	Arg	Ser 235	Leu	Gly	Pro	His	Asn 240
Tyr	Leu	Ser	Gly	His 245	Leu	Asp	Leu	Asn	Ser 250	Arg	Val	Tyr	Ser	Asn 255	Lys
Val	Glu	Tyr	Asn 260	Val	Ile	Asp	Asp	Val 265	Thr	Pro	Gln	Tyr	Leu 270	Lys	Leu
Lys	His	Trp	Lys	Glu	Leu	Ile	Gly	Ala	Gln	Arg	Asp	Trp	Gln	Thr	Asn

Cys Lys Tyr Gly Lys Pro Val Gln Ile Lys Gly Gly Ile Pro Ser Ile

-	290	_	_			295					300					
Val 305	Leu	Cys	Asn	Pro	Gly 310	Glu	Gly	Ala	Ser	Tyr 315	Lys	Val	Phe	Leu	Asp 320	
Lys	Glu	Glu	Asn	Thr 325	Pro	Leu	Lys	Asn	Trp 330	Thr	Phe	His	Asn	Ala 335	Lys	
Phe	Val	Phe	Leu 340	Asn	Ser	Pro	Leu	Tyr 345	Gln	Ser	Ser	Thr	Gln 350	Ser	Ser	
<210 <211 <212 <213	L>	57 1056 DNA Fomat	co go	older	n mos	saic	vir	ıs								
<220 <221 <222 <223	L> ( 2> 3> 5				159	(Ala'	7) mi	utant	E							
_	cca	_			aaa Lys						_					4.8
				_	tgc Cys		_			_	_					96
					act Thr											144
					gat Asp											192
					tgc Cys 70	_				_			_	_	_	240
					gca Ala											288
_			_	_	aag Lys	_			_		_		_			336

1	00	105	110

								ggt Gly							384
				_	_	_	_	gag Glu			_				432
_	_	_	_	_			_	gag Glu			-	_	-		480
	_						_	aat Asn		_			_	_	528
		_					_	ttc Phe 185		_					576
		_		_	_			gct Ala	_				_	_	624
	_			_		_		att Ile	_					_	672
								gct Ala							720
								aat Asn							768
_				_		_	_	gtc Val 265		_			_	_	816
								gcc Ala							864
_				_		_		att Ile				_			912
								gct Ala							960
								aac Asn							1008

ttc gtc ttc ctc aac tcc ccc ctc tat caa agc tca aca cag agc agc 1056
Phe Val Phe Leu Asn Ser Pro Leu Tyr Gln Ser Ser Thr Gln Ser Ser
340 345 350

<210> 68

<211> 352

<212> PRT

<213> Tomato golden mosaic virus

<400> 68

Met Pro Ser His Pro Lys Arg Phe Gln Ile Asn Ala Lys Asn Tyr Phe 1 5 10 15

Leu Thr Tyr Pro Gln Cys Ser Leu Ser Lys Glu Glu Ser Leu Ser Gln 20 25 30

Leu Gln Ala Leu Asn Thr Pro Ile Asn Lys Lys Phe Ile Lys Ile Cys 35 40 45

Arg Glu Leu His Glu Asp Gly Gln Pro His Leu His Val Leu Ile Gln 50 55 60

Phe Glu Gly Lys Tyr Cys Cys Gln Asn Gln Arg Phe Phe Asp Leu Val 65 70 75 80

Ser Pro Thr Arg Ser Ala His Phe His Pro Asn Ile Gln Arg Ala Lys 85 90 95

Ser Ser Ser Asp Val Lys Thr Tyr Ile Asp Lys Asp Gly Asp Thr Leu 100 105 110

Val Trp Gly Glu Phe Gln Val Asp Gly Arg Ser Ala Arg Gly Gly Cys 115 120 125

Gln Thr Ser Asn Asp Ala Ala Ala Glu Ala Leu Asn Ala Ser Ser Lys 130 135 140

Glu Glu Ala Leu Gln Ile Ile Arg Glu Lys Ile Pro Ala Ala Ala Leu 145 150 155 160

Phe Gln Phe His Asn Leu Asn Ser Asn Leu Asp Arg Ile Phe Asp Lys 165 170 175 Thr Pro Glu Pro Trp Leu Pro Pro Phe His Val Ser Ser Phe Thr Asn 180 185 190

Val Pro Asp Glu Met Arg Gln Trp Ala Glu Asn Tyr Phe Gly Lys Ser 195 200 205

Ser Ala Ala Arg Pro Glu Arg Pro Ile Ser Ile Ile Ile Glu Gly Asp 210 215 220

Ser Arg Thr Gly Lys Thr Met Trp Ala Arg Ser Leu Gly Pro His Asn 225 230 235 240

Tyr Leu Ser Gly His Leu Asp Leu Asn Ser Arg Val Tyr Ser Asn Lys 245 250 255

Val Glu Tyr Asn Val Ile Asp Asp Val Thr Pro Gln Tyr Leu Lys Leu 260 265 270

Lys His Trp Lys Glu Leu Ile Gly Ala Gln Arg Asp Trp Gln Thr Asn 275 280 285

Cys Lys Tyr Gly Lys Pro Val Gln Ile Lys Gly Gly Ile Pro Ser Ile 290 295 300

Val Leu Cys Asn Pro Gly Glu Gly Ala Ser Tyr Lys Val Phe Leu Asp 305 310 315 320

Lys Glu Glu Asn Thr Pro Leu Lys Asn Trp Thr Phe His Asn Ala Lys 325 330 335

Phe Val Phe Leu Asn Ser Pro Leu Tyr Gln Ser Ser Thr Gln Ser Ser 340 345 350

<210> 69

<211> 1056

<212> DNA

<213> Tomato golden mosaic virus

<220>

<221> CDS

<222> (1)..(1056)

<223> TGMV AL1 Q-HN165 (Ala8) mutant

<400> 69

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Met 1	Pro	Ser	His	Pro 5	Lys	Arg	Phe	Gln	Ile 10	Asn	Ala	Lys	Asn	Tyr 15	Phe	
											gaa Glu					96
											ttc Phe					144
aga Arg	gag Glu 50	ctt Leu	cat His	gaa Glu	gat Asp	999 Gly 55	caa Gln	cct Pro	cac His	ctc Leu	cac His 60	gtg Val	ctt Leu	att Ile	cag Gln	192
											ttc Phe					240
											att Ile					288
											gac Asp					336
											gct Ala					384
											aat Asn 140					432
											cca Pro					480
											agg Arg					528
											tca Ser					576
gtg Val	cca Pro	gac Asp 195	gag Glu	atg Met	aga Arg	caa Gln	tgg Trp 200	gct Ala	gaa Glu	aat Asn	tat Tyr	ttt Phe 205	gga Gly	aag Lys	agt Ser	624
											atc Ile 220					672
agt Ser	cgg Arg	acg Thr	gga Gly	aag Lys	act Thr	atg Met	tgg Trp	gct Ala	cgt Arg	tca Ser	cta Leu	ggc Gly	cca Pro	cat His	aat Asn	720

225	230	235	240
tat ttg agc ggg cat Tyr Leu Ser Gly His 245		r Arg Val Tyr Ser As	
gtt gag tat aac gtc Val Glu Tyr Asn Val 260		a ccg caa tat cta a r Pro Gln Tyr Leu L 270	
		a aga gat tgg cag ao n Arg Asp Trp Gln Tl 285	
		a gga ggt atc ccg to s Gly Gly Ile Pro So 300	
		rc tat aaa gtt ttc c r Tyr Lys Val Phe L 315	
	Pro Leu Lys Asn Tr	g act ttc cat aat gr p Thr Phe His Asn A 0 3	
		a agc tca aca cag ag n Ser Ser Thr Gln S 350	
<210> 70 <211> 352 <212> PRT <213> Tomato golde	n mosaic virus		
<400> 70			_,
Met Pro Ser His Pro 1 5	Lys Arg Phe Gln Il 10	e Asn Ala Lys Asn T 1	
Leu Thr Tyr Pro Gln 20	Cys Ser Leu Ser Ly 25	rs Glu Glu Ser Leu S 30	er Gln
Leu Gln Ala Leu Asn 35	Thr Pro Ile Asn Ly 40	rs Lys Phe Ile Lys I 45	le Cys

Arg Glu Leu His Glu Asp Gly Gln Pro His Leu His Val Leu Ile Gln

Phe Glu Gly Lys Tyr Cys Cys Gln Asn Gln Arg Phe Phe Asp Leu Val 65 70 75 80

ser	Pro	Tnr	Arg	85	Ala	HIS	Pne	HIS	90	ASII	TIE	GIII	Arg	95	пуѕ
Ser	Ser	Ser	Asp 100	Val	Lys	Thr	Tyr	Ile 105	Asp	Lys	Asp	Gly	Asp 110	Thr	Leu
Val	Trp	Gly 115	Glu	Phe	Gln	Val	Asp 120	Gly	Arg	Ser	Ala	Arg 125	Gly	Gly	Cys
Gln	Thr 130	Ser	Asn	Asp	Ala	Ala 135	Ala	Glu	Ala	Leu	Asn 140	Ala	Ser	Ser	Lys
Glu 145	Glu	Ala	Leu	Gln	Ile 150	Ile	Arg	Glu	Ļys	Ile 155	Pro	Glu	Lys	Tyr	Leu 160
Phe	Ala	Phe	Ala	Ala 165	Leu	Asn	Ser	Asn	Leu 170	Asp	Arg	Ile	Phe	Asp 175	Lys
Thr	Pro	Glu	Pro 180	Trp	Leu	Pro	Pro	Phe 185	His	Val	Ser	Ser	Phe 190	Thr	Asn
Val	Pro	Asp 195	Glu	Met	Arg	Gln	Trp 200	Ala	Glu	Asn	Tyr	Phe 205	Gly	Lys	Ser
Ser	Ala 210	Ala	Arg	Pro	Glu	Arg 215	Pro	Ile	Ser	Ile	Ile 220	Ile	Glu	Gly	Asp
Ser 225	Arg	Thr	Gly	Lys	Thr 230	Met	Trp	Ala	Arg	Ser 235	Leu	Gly	Pro	His	Asn 240
Tyr	Leu	Ser	Gly	His 245	Leu	Asp	Leu	Asn	Ser 250	Arg	Val	Tyr	Ser	Asn 255	Lys
Val	Glu	Tyr	Asn 260	Val	Ile	Asp	Asp	Val 265	Thr	Pro	Gln	Tyr	Leu 270	Lys	Leu
Lys	His	Trp 275	Lys	Glu	Leu	Ile	Gly 280	Ala	Gln	Arg	Asp	Trp 285	Gln	Thr	Asn
Cys	Lys 290	Tyr	Gly	Lys	Pro	Val 295	Gln	Ile	Lys	Gly	Gly 300	Ile	Pro	Ser	Ile

Val 305	Leu	Cys	Asn	Pro	Gly 310	Glu	Gly	Ala	Ser	Tyr 315	Lys	Val	Phe	Leu	Asp 320	
Lys	Glu	Glu	Asn	Thr 325	Pro	Leu	Lys	Asn	Trp 330	Thr	Phe	His	Asn	Ala 335	Lys	
Phe	Val	Phe	Leu 340	Asn	Ser	Pro	Leu	Tyr 345	Gln	Ser	Ser	Thr	Gln 350	Ser	Ser	
<210 <211 <212 <213	.> 1 :> E	1 .056 NA 'omat	o go	older	ı mos	saic	viru	ıs								
<220 <221 <222 <223	.> C		-		R172	(Ala	19) r	nutar	nt							
	cca				aaa Lys											48
					tgc Cys											96
					act Thr											144
					gat Asp											192
					tgc Cys 70											240
					gca Ala											288
					aag Lys											336
gta Val	tgg Trp	gga Gly 115	gaa Glu	ttc Phe	cag Gln	gtc Val	gac Asp 120	ggt Gly	cga Arg	agt Ser	gct Ala	aga Arg 125	gga Gly	ggt Gly	tgc Cys	384
																420

caa aca tct aac gac gct gca gca gag gcg tta aat gct tct tcc aaa 432

Gln Thr Set	r Asn Asp	Ala Ala 135	Ala Glu	Ala Leu	Asn Ala 140	Ser Ser	Lys	
gaa gaa gc Glu Glu Ala 145	c ctg cag a Leu Gln	ata att Ile Ile 150	aga gag Arg Glu	aaa ato Lys Ile 155	e Pro Glu	aaa tat Lys Tyr	tta Leu 160	480
ttt cag tt	c cac aat e His Asn 165	cta aat Leu Asn	agc gcg Ser Ala	cta gct Leu Ala 170	gcg ata Ala Ile	ttt gat Phe Asp 175	Lys	528
act cct ga Thr Pro Gl	a cca tgg u Pro Trp 180	ctt cct Leu Pro	ccg ttc Pro Phe 185	cac gto	c tca tca L Ser Ser	ttt act Phe Thr 190	aac Asn	576
gtg cca ga Val Pro As 19	p Glu Met	aga caa Arg Gln	tgg gct Trp Ala 200	gaa aat Glu Asr	t tat ttt n Tyr Phe 205	gga aag Gly Lys	agt Ser	624
tcc gct gc Ser Ala Al 210	g cgg ccg a Arg Pro	gag aga Glu Arg 215	cct att Pro Ile	agt att Ser Ile	t atc atc e Ile Ile 220	gag ggo Glu Gly	gat Asp	672
agt cgg ac Ser Arg Th 225	g gga aag r Gly Lys	act atg Thr Met 230	tgg gct Trp Ala	cgt tca Arg Ser 23!	r Leu Gly	cca cat Pro His	aat Asn 240	720
tat ttg ag Tyr Leu Se	c ggg cat r Gly His 245	Leu Asp	ctc aat Leu Asn	tct agg Ser Arg 250	g gtt tac g Val Tyr	tca aad Ser Asi 255	Lys	768
gtt gag ta Val Glu Ty	t aac gto r Asn Val 260	atc gat Ile Asp	gat gto Asp Val 265	Thr Pro	g caa tat o Gln Tyr	cta aag Leu Lys 270	ttg Leu	816
aaa cat tg Lys His Tr 27	p Lys Glu	ctc att Leu Ile	ggg gcc Gly Ala 280	caa aga Gln Arg	a gat tgg g Asp Trp 285	Gln Th	aac Asn	864
tgt aaa ta Cys Lys Ty 290	ic gga aag r Gly Lys	g cca gtt s Pro Val 295	Gln Ile	aaa gg	a ggt atc y Gly Ile 300	ccg tca Pro Sea	atc : Ile	912
gtg ctg tg Val Leu Cy 305	gc aat cct ys Asn Pro	gga gag Gly Glu 310	ggt gct Gly Ala	agc ta Ser Ty 31	r Lys Val	ttc cto	gac 1 Asp 320	960
aaa gag ga Lys Glu Gl	ia aac act .u Asn Thi 325	r Pro Leu	aag aad Lys Asr	tgg ac Trp Th	t ttc cat r Phe His	aat gcg Asn Ala 33	a Lys	1008
ttc gtc tt Phe Val Ph	c ctc aad ne Leu Asi 340	c tcc ccc n Ser Pro	ctc tat Leu Tyr 345	Gln Se	c tca aca r Ser Thr	cag age Gln Se 350	e agc Ser	1056

<211> 352

<212> PRT

<213> Tomato golden mosaic virus

<400> 72

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Leu Thr Tyr Pro Gln Cys Ser Leu Ser Lys Glu Glu Ser Leu Ser Gln 20 25 30

Leu Gln Ala Leu Asn Thr Pro Ile Asn Lys Lys Phe Ile Lys Ile Cys 35 40 45

Arg Glu Leu His Glu Asp Gly Gln Pro His Leu His Val Leu Ile Gln 50 55 60

Phe Glu Gly Lys Tyr Cys Cys Gln Asn Gln Arg Phe Phe Asp Leu Val 65 70 75 80

Ser Pro Thr Arg Ser Ala His Phe His Pro Asn Ile Gln Arg Ala Lys 85 90 95

Ser Ser Ser Asp Val Lys Thr Tyr Ile Asp Lys Asp Gly Asp Thr Leu 100 105 110

Val Trp Gly Glu Phe Gln Val Asp Gly Arg Ser Ala Arg Gly Gly Cys 115 120 125

Gln Thr Ser Asn Asp Ala Ala Ala Glu Ala Leu Asn Ala Ser Ser Lys 130 135 140

Glu Glu Ala Leu Gln Ile Ile Arg Glu Lys Ile Pro Glu Lys Tyr Leu 145 150 155 160

Phe Gln Phe His Asn Leu Asn Ser Ala Leu Ala Ala Ile Phe Asp Lys 165 170 175

Thr Pro Glu Pro Trp Leu Pro Pro Phe His Val Ser Ser Phe Thr Asn 180 185 190

Val Pro Asp Glu Met Arg Gln Trp Ala Glu Asn Tyr Phe Gly Lys Ser 195 200 205

Ser	A1a 210	Ala	Arg	Pro	GIU	Arg 215	Pro	iie	ser	iie	220	iie	GIU	GIY	Asp		
Ser 225	Arg	Thr	Gly	Lys	Thr 230	Met	Trp	Ala	Arg	Ser 235	Leu	Gly	Pro	His	Asn 240		
Tyr	Leu	Ser	Gly	His 245	Leu	Asp	Leu	Asn	Ser 250	Arg	Val	Tyr	Ser	Asn 255	Lys		
Val	Glu	Tyr	Asn 260	Val	Ile	Asp	Asp	Val 265	Thr	Pro	Gln	Tyr	Leu 270	Lys	Leu		
Lys	His	Trp 275	Lys	Glu	Leu	Ile	Gly 280	Ala	Gln	Arg	Asp	Trp 285	Gln	Thr	Asn		
Cys	Lys 290	Tyr	Gly	Lys	Pro	Val 295	Gln	Ile	Lys	Gly	Gly 300	Ile	Pro	Ser	Ile		
Val 305	Leu	Cys	Asn	Pro	Gly 310	Glu	Gly	Ala	Ser	Tyr 315	Lys	Val	Phe	Leu	Asp 320	i,	
Lys	Glu	Glu	Asn	Thr 325	Pro	Leu	Lys	Asn	Trp 330	Thr	Phe	His	Asn	Ala 335	Lys		
Phe	Val	Phe	Leu 340	Asn	_Ser	Pro	Leu	Tyr 345	Gln	Ser	Ser	Thr	Gln 350	Ser	Ser		
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	сса	73 tcg Ser															48
		tat Tyr															96

					act Thr											144
aga Arg	gag Glu 50	ctt Leu	cat His	gaa Glu	gat Asp	ggg 55	caa Gln	cct Pro	cac His	ctc Leu	cac His 60	gtg Val	ctt Leu	att Ile	cag Gln	192
ttc Phe 65	gag Glu	gga Gly	aaa Lys	tac Tyr	tgc Cys 70	tgc Cys	caa Gln	aat Asn	caa Gln	cga Arg 75	ttc Phe	ttc Phe	gac Asp	ctg Leu	gta Val 80	240
tcc Ser	cca Pro	aca Thr	agg Arg	tca Ser 85	gca Ala	cat His	ttc Phe	cat His	cca Pro 90	aac Asn	att Ile	cag Gln	aga Arg	gct Ala 95	aaa Lys	288
					aag Lys											336
Val	Trp	Gly 115	Glu	Phe	cag Gln	Val	Asp 120	Gly	Arg	Ser	Ala	Arg 125	Gly	Gly	Cys	384
Gln	Thr 130	Ser	Asn	Asp	gct Ala	Ala 135	Ala	Glu	Ala	Leu	Asn 140	Ala	Ser	Ser	Lys	432
Glu 145	Glu	Ala	Leu	Gln	ata Ile 150	Ile	Arg	Glu	Lys	Ile 155	Pro	Glu	Lys	Tyr	Leu 160	480
Phe	Gln	Phe	His	Asn 165	cta Leu	Asn	Ser	Asn	Leu 170	Asp	Arg	Ile	Phe	Asp 175	Ala	528
Thr	Pro	Ala	Pro 180	Trp	ctt Leu	Pro	Pro	Phe 185	His	Val	Ser	Ser	Phe 190	Thr	Asn	576
Val	Pro	Asp 195	Glu	Met	aga Arg	Gln	Trp 200	Ala	Glu	Asn	Tyr	Phe 205	Gly	Lys	Ser	624
Ser	Ala 210	Ala	Arg	Pro	gag Glu	Arg 215	Pro	Ile	Ser	Ile	Ile 220	Ile	Glu	Gly	Asp	672
Ser 225	Arg	Thr	Gly	Lys	act Thr 230	Met	Trp	Ala	Arg	Ser 235	Leu	Gly	Pro	His	Asn 240	720
tat Tyr	ttg Leu	agc Ser	Gly	cat His 245	ttg Leu	gat Asp	ctc Leu	aat Asn	tct Ser 250	agg Arg	gtt Val	tac Tyr	tca Ser	aac Asn 255	aag Lys	768
gtt	gag	tat	aac	gtc	atc	gat	gat	gtc	aca	ccg	caa	tat	cta	aag	ttg	816

Val	Glu	Tyr	Asn 260	Val	Ile	Asp	Asp	Val 265	Thr	Pro	Gln	Tyr	Leu 270	Lys	Leu	
aaa Lys	cat His	tgg Trp 275	aaa Lys	gaa Glu	ctc Leu	att Ile	999 Gly 280	gcc Ala	caa Gln	aga Arg	gat Asp	tgg Trp 285	cag Gln	act Thr	aac Asn	864
tgt Cys																912
gtg Val 305	ctg Leu	tgc Cys	aat Asn	cct Pro	gga Gly 310	gag Glu	ggt Gly	gct Ala	agc Ser	tat Tyr 315	aaa Lys	gtt Val	ttc Phe	ctc Leu	gac Asp 320	960
aaa Lys											ttc Phe					1008
											tca Ser					1056
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Met 1	Pro	Ser		5					10		Ala Glu			15		
Met 1 Leu	Pro Thr	Ser	Pro 20	5 Gln	Cys	Ser	Leu	Ser 25	10 Lys	Glu		Ser	Leu 30	15 Ser	Gln	
Met 1 Leu	Pro Thr	Ser Tyr Ala 35	Pro 20 Leu	5 Gln Asn	Cys Thr	Ser Pro	Leu Ile 40	Ser 25 Asn	10 Lys Lys	Glu Lys	Glu	Ser Ile 45	Leu 30 Lys	Ser	Gln Cys	
Met 1 Leu Leu	Pro Thr Gln Glu 50	Ser Tyr Ala 35 Leu	Pro 20 Leu	5 Gln Asn Glu	Cys Thr Asp	Ser Pro Gly 55	Leu Ile 40	Ser 25 Asn Pro	Lys Lys His	Glu Lys Leu	Glu Phe	Ser Ile 45 Val	Leu 30 Lys Leu	Ser Ile	Gln Cys Gln	
Met 1 Leu Leu Arg	Pro Thr Gln Glu 50	Ser Tyr Ala 35 Leu Gly	Pro 20 Leu His	5 Gln Asn Glu Tyr	Cys Thr Asp Cys 70	Ser Pro Gly 55 Cys	Leu Ile 40 Gln	Ser 25 Asn Pro	Lys Lys His	Glu Lys Leu Arg 75	Glu Phe His	Ser Ile 45 Val	Leu 30 Lys Leu Asp	Ser Ile Ile	Gln Cys Gln Val 80	

Val	Trp	115	GIU	Pne	GIII	vai	120	дтЪ	Arg	ser	AIA	125	GIY	GIY	Cys
Gln	Thr 130	Ser	Asn	Asp	Ala	Ala 135	Ala	Glu	Ala	Leu	Asn 140	Ala	Ser	Ser	Lys
Glu 145	Glu	Ala	Leu	Gln	Ile 150	Ile	Arg	Glu	Lys	Ile 155	Pro	Glu	Lys	Tyr	Leu 160
Phe	Gln	Phe	His	Asn 165	Leu	Asn	Ser	Asn	Leu 170	Asp	Arg	Ile	Phe	Asp 175	Ala
Thr	Pro	Ala	Pro 180	Trp	Leu	Pro	Pro	Phe 185	His	Val	Ser	Ser	Phe 190	Thr	Asn
Val	Pro	Asp 195	Glu	Met	Arg	Gln	Trp 200	Ala	Glu	Asn	Tyr	Phe 205	Gly	Lys	Ser
Ser	Ala 210	Ala	Arg	Pro	Glu	Arg 215	Pro	Ile	Ser	Ile	Ile 220	Ile	Glu	Gly	Asp
Ser 225	Arg	Thr	Gly	Lys	Thr 230	Met	Trp	Ala	Arg	Ser 235	Leu	Gly	Pro	His	Asn 240
Tyr	Leu	Ser	Gly	His 245	Leu	Asp	Leu	Asn	Ser 250	Arg	Val	Tyr	Ser	Asn 255	Lys
Val	Glu	Tyr	Asn 260	Val	Ile	Asp	Asp	Val 265		Pro	Gln	Tyr	Leu 270	Lys	Leu
Lys	His	Trp 275		Glu	Ļeu	Ile	Gly 280	Ala	Gln	Arg	Asp	Trp 285		Thr	Asn
Cys	Lys 290		Gly	Lys	Pro	Val 295	Gln	Ile	Lys	Gly	Gly 300		Pro	Ser	Ile
Val 305		Cys	Asn	Pro	Gly 310		Gly	Ala	Ser	Tyr 315		Val	Phe	Leu	Asp 320
Lys	Glu	Glu	Asn	Thr 325		Leu	Lys	Asn	Trp		Phe	His	Asn	Ala 335	

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Phe Val Phe Leu Asn Ser Pro Leu Tyr Gln Ser Ser Thr Gln Ser Ser

345

340

140

432

480

caa aca tot aac gac ott ota ota gag goo tta aat got tot too aaa

Gln Thr Ser Asn Asp Leu Leu Leu Glu Ala Leu Asn Ala Ser Ser Lys

gaa gaa gcc ctg cag ata att aga gag aaa atc cca gaa aaa tat tta

Glu Glu Ala Leu Gln Ile Ile Arg Glu Lys Ile Pro Glu Lys Tyr Leu

135

150

130

ttt Phe	cag Gln	ttc Phe	cac His	aat Asn 165	cta Leu	aat Asn	agc Ser	aat Asn	tta Leu 170	gat Asp	agg Arg	ata Ile	ttt Phe	gat Asp 175	aag Lys	528
act Thr	cct Pro	gaa Glu	cca Pro 180	tgg Trp	ctt Leu	cct Pro	ccg Pro	ttc Phe 185	cac His	gtc Val	tca Ser	tca Ser	ttt Phe 190	act Thr	aac Asn	576
gtg Val	cca Pro	gac Asp 195	gag Glu	atg Met	aga Arg	caa Gln	tgg Trp 200	gct Ala	gaa Glu	aat Asn	tat Tyr	ttt Phe 205	gga Gly	aag Lys	agt Ser	624
tcc Ser	gct Ala 210	gcg Ala	cgg Arg	ccg Pro	gag Glu	aga Arg 215	cct Pro	att Ile	agt Ser	att Ile	atc Ile 220	atc Ile	gag Glu	ggc Gly	gat Asp	672
agt Ser 225	cgg Arg	acg Thr	gga Gly	aag Lys	act Thr 230	atg Met	tgg Trp	gct Ala	cgt Arg	tca Ser 235	cta Leu	ggc Gly	cca Pro	cat His	aat Asn 240	720
tat Tyr	ttg Leu	agc Ser	Gly ggg	cat His 245	ttg Leu	gat Asp	ctc Leu	aat Asn	tct Ser 250	agg Arg	gtt Val	tac Tyr	tca Ser	aac Asn 255	aag Lys	768
Val	Glu	Tyr	Asn 260	Val	Ile	Asp	Asp	gtc Val 265	Thr	Pro	Gln	Tyr	Leu 270	Lys	Leu	816
Lys	His	Trp 275	Lys	Glu	Leu	Ile	Gly 280	gcc Ala	Gln	Arg	Asp	Trp 285	Gln	Thr	Asn	864
Cys	Lys 290	Tyr	Gly	Lys	Pro	Val 295	Gln	att Ile	Lys	Gly	Gly 300	Ile	Pro	Ser	Ile	912
Val 305	Leu	Cys	Asn	Pro	Gly 310	Glu	Gly	gct Ala	Ser	Tyr 315	Lys	Val	Phe	Leu	Asp 320	960
Lys	Glu	Glu	Asn	Thr 325	Pro	Leu	Lys	Asn	Trp 330	Thr	Phe	His	Asn	Ala 335		1008
ttc Phe	gtc Val	ttc Phe	ctc Leu 340	Asn	tcc Ser	ccc Pro	ctc Leu	tat Tyr 345	caa Gln	agc Ser	tca Ser	aca Thr	cag Gln 350	Ser	agc Ser	1056

<210> 76

<211> 352

<212> PRT

<213> Tomato golden mosaic virus

<400> 76

Met Pro Ser His Pro Lys Arg Phe Gln Ile Asn Ala Lys Asn Tyr Phe

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Leu Thr Tyr Pro Gln Cys Ser Leu Ser Lys Glu Glu Ser Leu Ser Gln 20 25 30

Leu Gln Ala Leu Asn Thr Pro Ile Asn Lys Lys Phe Ile Lys Ile Cys 35 40 45

Arg Glu Leu His Glu Asp Gly Gln Pro His Leu His Val Leu Ile Gln 50 55 60

Phe Glu Gly Lys Tyr Cys Cys Gln Asn Gln Arg Phe Phe Asp Leu Val 65 70 75 80

Ser Pro Thr Arg Ser Ala His Phe His Pro Asn Ile Gln Arg Ala Lys 85 90 95

Ser Ser Ser Asp Val Lys Thr Tyr Ile Asp Lys Asp Gly Asp Thr Leu 100 105 110

Val Trp Gly Glu Phe Gln Val Asp Gly Arg Ser Ala Arg Gly Gly Cys 115 120 125

Gln Thr Ser Asn Asp Leu Leu Leu Glu Ala Leu Asn Ala Ser Ser Lys 130 135 140

Glu Glu Ala Leu Gln Ile Ile Arg Glu Lys Ile Pro Glu Lys Tyr Leu 145 150 155 160

Phe Gln Phe His Asn Leu Asn Ser Asn Leu Asp Arg Ile Phe Asp Lys 165 170 175

Thr Pro Glu Pro Trp Leu Pro Pro Phe His Val Ser Ser Phe Thr Asn 180 185 190

Val Pro Asp Glu Met Arg Gln Trp Ala Glu Asn Tyr Phe Gly Lys Ser 195 200 205

Ser Ala Ala Arg Pro Glu Arg Pro Ile Ser Ile Ile Ile Glu Gly Asp 210 215 220

Ser Arg Thr Gly Lys Thr Met Trp Ala Arg Ser Leu Gly Pro His Asn 225 230 235 240

	Gly His 245	Leu Asp	Leu Asn	Ser Arg 250	Val Tyr	Ser Asn 255	Lys
Val Glu Țyr	Asn Val 260	Ile Asp	Asp Val 265	Thr Pro	Gln Tyr	Leu Lys 270	Leu
Lys His Trp 275	Lys Glu	Leu Ile	Gly Ala 280	Gln Arg	Asp Trp 285	Gln Thr	Asn
Cys Lys Tyr 290	Gly Lys	Pro Val 295		Lys Gly	Gly Ile 300	Pro Ser	Ile
Val Leu Cys 305	Asn Pro	Gly Glu 310	Gly Ala	Ser Tyr 315	Lys Val	Phe Leu	Asp 320
Lys Glu Glu	Asn Thr 325	Pro Leu	Lys Asn	Trp Thr 330	Phe His	Asn Ala 335	
Phe Val Phe	Leu Asn 340	Ser Pro	Leu Tyr 345		Ser Thr	Gln Ser 350	Ser
<210> 77 <211> 1056 <212> DNA <213> Toma	to golde	n mosaic	virus				·
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					tgc Cys 70											240
					gca Ala											288
					aag Lys											336
					cag Gln											384
					gct Ala											432
					ata Ile 150											480
					cta Leu											528
					ctt Leu											576
					aga Arg											624
					gag Glu											672
agt Ser 225	cgg Arg	acg Thr	gga Gly	aag Lys	act Thr 230	atg Met	tgg Trp	gct Ala	cgt Arg	tca Ser 235	cta Leu	ggc Gly	cca Pro	cat His	aat Asn 240	720
					ttg Leu											768
					atc Ile											816
					ctc Leu											864

tgt aaa tac gga aag cca gtt caa att aaa gga ggt atc ccg tca atc  Cys Lys Tyr Gly Lys Pro Val Gln Ile Lys Gly Gly Ile Pro Ser Ile  290 295 300	2
gtg ctg tgc aat cct gga gag ggt gct agc tat aaa gtt ttc ctc gac Val Leu Cys Asn Pro Gly Glu Gly Ala Ser Tyr Lys Val Phe Leu Asp 305 310 315 320	)
aaa gag gaa aac act cca cta aag aac tgg act ttc cat aat gcg aaa 1008 Lys Glu Glu Asn Thr Pro Leu Lys Asn Trp Thr Phe His Asn Ala Lys 325 330 335	}
ttc gtc ttc ctc aac tcc ccc ctc tat caa agc tca aca cag agc agc Phe Val Phe Leu Asn Ser Pro Leu Tyr Gln Ser Ser Thr Gln Ser Ser 340 345 350	;
<210> 78 <211> 352 <212> PRT <213> Tomato golden mosaic virus	
<400> 78	
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Leu Gln Ala Leu Asn Thr Pro Ile Asn Lys Lys Phe Ile Lys Ile Cys 35 40 45	
Arg Glu Leu His Glu Asp Gly Gln Pro His Leu His Val Leu Ile Gln 50 55 60	
Phe Glu Gly Lys Tyr Cys Cys Gln Asn Gln Arg Phe Phe Asp Leu Val 65 70 75 80	
Ser Pro Thr Arg Ser Ala His Phe His Pro Asn Ile Gln Arg Ala Lys 85 90 95	
Ser Ser Ser Asp Val Lys Thr Tyr Ile Asp Lys Asp Gly Asp Thr Leu 100 105 110	

Val Trp Gly Glu Phe Gln Val Asp Gly Arg Ser Ala Arg Gly Gly Cys 120

Gln Thr Ser Asn Asp Ala Ala Ala Ala Leu Ala Ala Ser Ser Ala

130 135 140

Phe Gln Phe His Asn Leu Asn Ser Asn Leu Asp Arg Ile Phe Asp Lys
165 170 175

Thr Pro Glu Pro Trp Leu Pro Pro Phe His Val Ser Ser Phe Thr Asn 180 185 190

Val Pro Asp Glu Met Arg Gln Trp Ala Glu Asn Tyr Phe Gly Lys Ser 195 200 205

Ser Ala Ala Arg Pro Glu Arg Pro Ile Ser Ile Ile Ile Glu Gly Asp 210 215 220

Ser Arg Thr Gly Lys Thr Met Trp Ala Arg Ser Leu Gly Pro His Asn 225 230 235 240

Tyr Leu Ser Gly His Leu Asp Leu Asn Ser Arg Val Tyr Ser Asn Lys 245 250 255

Val Glu Tyr Asn Val Ile Asp Asp Val Thr Pro Gln Tyr Leu Lys Leu 260 265 270

Lys His Trp Lys Glu Leu Ile Gly Ala Gln Arg Asp Trp Gln Thr Asn 275 280 285

Cys Lys Tyr Gly Lys Pro Val Gln Ile Lys Gly Gly Ile Pro Ser Ile 290 295 300

Val Leu Cys Asn Pro Gly Glu Gly Ala Ser Tyr Lys Val Phe Leu Asp 305 310 315 320

Lys Glu Glu Asn Thr Pro Leu Lys Asn Trp Thr Phe His Asn Ala Lys 325 330 335

Phe Val Phe Leu Asn Ser Pro Leu Tyr Gln Ser Ser Thr Gln Ser Ser 340 345 350

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Thr Pro Glu Pro Trp Leu Pro Pro Phe His Val Ser Ser Phe Thr Asn

185

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tcc gct gcg cg Ser Ala Ala Ar 210	g Pro Glu A								
agt cgg acg gg Ser Arg Thr Gl 225	a aag act a y Lys Thr Mo 230	tg tgg gct ( et Trp Ala 2	cgt tca cta q Arg Ser Leu ( 235	ggc cca cat Gly Pro His	aat 720 Asn 240				
tat ttg agc gg Tyr Leu Ser Gl		sp Leu Asn							
gtt gag tat aa Val Glu Tyr As 26	n Val Ile A	at gat gtc a sp Asp Val ' 265	aca ccg caa Thr Pro Gln '	tat cta aag Tyr Leu Lys 270	ttg 816 Leu				
aaa cat tgg aa Lys His Trp Ly 275			Gln Arg Asp '						
tgt aaa tac gg Cys Lys Tyr Gl 290	y Lys Pro V								
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aaa gag gaa aa Lys Glu Glu As		eu Lys Asn			Lys				
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Leu Thr Tyr Pro Gln Cys Ser Leu Ser Lys Glu Glu Ser Leu Ser Gln

Leu	Gln	Ala 35	Leu	Asn	Thr	Pro	Ile 40	Asn	Lys	Lys	Phe	Ile 45	Lys	Ile	Cys
Arg	Glu 50	Leu	His	Glu	Asp	Gly 55	Gln	Pro	His	Leu	His 60	Val	Leu	Ile	Gln
Phe 65	Glu	Gly	Lys	Tyr	Cys 70	Cys	Gln	Asn	Gln	Arg 75	Phe	Phe	Asp	Leu	Val 80
Ser	Pro	Thr	Arg	Ser 85	Ala	His	Phe	His	Pro 90	Asn	Ile	Gln	Arg	Ala 95	Lys
Ser	Ser	Ser	Asp 100	Val	Lys	Thr	Tyr	Ile 105	Asp	Lys	Asp	Gly	Asp 110	Thr	Leu
Val	Trp	Gly 115	Glu	Phe	Gln	Val	Asp 120	Gly	Arg	Ser	Ala	Arg 125	Gly	Gly	Cys
Gln	Thr 130	Ser	Asn	Asp	Ala	Ala 135	Ala	Glu	Ala	Leu	Asn 140	Ala	Ser	Ser	Ala
Glu 145	Glu	Ala	Leu	Gln	Ile 150	Ile	Arg	Glu	Lys	Ile 155	Pro	Glu	Lys	Tyr	Leu 160
Phe	Gln	Phe	His	Asn 165	Leu	Asn	Ser	Asn	Leu 170	Asp	Arg	Ile	Phe	Asp 175	Lys
Thr	Pro	Glu	Pro 180	Trp	Leu	Pro	Pro	Phe 185	His	Val	Ser	Ser	Phe 190	Thr	Asn
Val	Pro	Asp 195	Glu	Met	Arg	Gln	Trp 200	Ala	Glu	Asn	Tyr	Phe 205	Gly	Lys	Ser
Ser	Ala 210	Ala	Arg	Pro	Glu	Arg 215	Pro	Ile	Ser	Ile	Ile 220	Ile	Glu	Gly	Asp
Ser 225	Arg	Thr	Gly	Lys	Thr 230	Met	Trp	Ala	Arg	Ser 235	Leu	Gly	Pro	His	Asn 240
Tyr	Leu	Ser	Gly	His 245	Leu	Asp	Leu	Asn	Ser 250	Arg	Val	Tyr	Ser	Asn 255	Lys
17a 1	Gl 11	ጥነታ	Δen	Va 1	Tle	Agn	Agn	Val	Thr	Pro	Gln	Tvr	Leu	Lvs	Len

Lys	His	Trp 275	Lys	Glu	Leu	Ile	Gly 280	Ala	Gln	Arg	Asp	Trp 285	Gln	Thr	Asn	
Cys	Lys 290	Tyr	Gly	Lys	Pro	Val 295	Gln	Ile	Lys	Gly	Gly 300	Ile	Pro	Ser	Ile	
Val 305	Leu	Cys	Asn	Pro	Gly 310	Glu	Gly	Ala	Ser	Tyr 315	Lys	Val	Phe	Leu	Asp 320	
Lys	Glu	Glu	Asn	Thr 325	Pro	Leu	Lys	Asn	Trp 330	Thr	Phe	His	Asn	Ala 335	Lys	
Phe	Val	Phe	Leu 340	Asn	Ser	Pro	Leu	Tyr 345	Gln	Ser	Ser	Thr	Gln 350	Ser	Ser	
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	cca				aaa Lys											48
				_	tgc Cys		-			_						96
					act Thr											144
					gat Asp											192
					tgc Cys 70											240

85 90 95

						acg Thr										336
gta Val	tgg Trp	gga Gly 115	gaa Glu	ttc Phe	cag Gln	gtc Val	gac Asp 120	ggt Gly	cga Arg	agt Ser	gct Ala	aga Arg 125	gga Gly	ggt Gly	tgc Cys	384
						gca Ala 135										432
						att Ile										480
						aat Asn										528
						cct Pro										576
						caa Gln										624
						aga Arg 215										672
						atg Met										720
						gat Asp										768
						gat Asp										816
						att Ile										864
						gtt Val 295										912
						gag Glu										960

aaa gag gaa aad Lys Glu Glu Asi		u Lys Asn		His Asn A	
ttc gtc ttc ctc Phe Val Phe Ler 34	ı Asn Ser Pı				
<210> 82 <211> 352 <212> PRT <213> Tomato	golden mosa:	c virus			
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Met Pro Ser Hi 1	s Pro Lys A: 5	g Phe Gln	Ile Asn Ala 10	_	Tyr Phe 15
Leu Thr Tyr Pr	o Gln Cys So	er Leu Ser 25	Lys Glu Glu	Ser Leu S	Ser Gln
Leu Gln Ala Le 35	u Asn Thr P	o Ile Asn 40	Lys Lys Phe	Ile Lys 1	Ile Cys
Arg Glu Leu Hi 50	s Glu Asp G		His Leu His 60	Val Leu 1	Ile Gln
Phe Glu Gly Ly 65	s Tyr Cys C	rs Gln Asn	Gln Arg Phe 75	Phe Asp I	Leu Val 80
Ser Pro Thr Ar	g Ser Ala H 85	s Phe His	Pro Asn Ile 90		Ala Lys 95
Ser Ser Ser As	-	r Tyr Ile 105	Asp Lys Asp	Gly Asp 1	Thr Leu
Val Trp Gly Gl 115	u Phe Gln V	al Asp Gly 120	Arg Ser Ala	Arg Gly (	Gly Cys
Gln Thr Ser As	_	.a Ala Glu 85	Ala Leu Asn 140		Ser Lys
Ala Glu Ala Le 145	u Gln Ile I 150	le Arg Glu	Lys Ile Pro 155	Glu Lys 7	Tyr Leu 160

Phe Gln Phe His Asn Leu Asn Ser Asn Leu Asp Arg Ile Phe Asp Lys 165 170 175

Thr Pro Glu Pro Trp Leu Pro Pro Phe His Val Ser Ser Phe Thr Asn 180 185 190

Val Pro Asp Glu Met Arg Gln Trp Ala Glu Asn Tyr Phe Gly Lys Ser 195 200 205

Ser Ala Ala Arg Pro Glu Arg Pro Ile Ser Ile Ile Ile Glu Gly Asp 210 215 220

Ser Arg Thr Gly Lys Thr Met Trp Ala Arg Ser Leu Gly Pro His Asn 225 230 235 240

Tyr Leu Ser Gly His Leu Asp Leu Asn Ser Arg Val Tyr Ser Asn Lys 245 250 255

Val Glu Tyr Asn Val Ile Asp Asp Val Thr Pro Gln Tyr Leu Lys Leu 260 265 270

Lys His Trp Lys Glu Leu Ile Gly Ala Gln Arg Asp Trp Gln Thr Asn 275 280 285

Cys Lys Tyr Gly Lys Pro Val Gln Ile Lys Gly Gly Ile Pro Ser Ile 290 295 300

Val Leu Cys Asn Pro Gly Glu Gly Ala Ser Tyr Lys Val Phe Leu Asp 305 310 315 320

Lys Glu Glu Asn Thr Pro Leu Lys Asn Trp Thr Phe His Asn Ala Lys 325 330 335

Phe Val Phe Leu Asn Ser Pro Leu Tyr Gln Ser Ser Thr Gln Ser Ser 340 345 350

<210> 83

<211> 1056

<212> DNA

<213> Tomato golden mosaic virus

<220>

<221> CDS

<222> (1)..(1056)

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			cct Pro 20													96
			cta Leu													144
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			aaa Lys													240
			agg Arg													288
			gac Asp 100													336
			gaa Glu													384
			aac Asn													432
			ctg Leu													480
			cac His													528
			cca Pro 180													576
			gag Glu													624
			cgg Arg													672

210 215 220

				atg Met						720
_	_		_	gat Asp						768
				gat Asp						816
		_		att Ile	 _	_	_	 _		864
				gtt Val 295						912
				gag Glu						960
				cta Leu						1008
				ccc Pro						1056

<210> 84

<211> 352

<212> PRT

<213> Tomato golden mosaic virus

<400> 84

Met Pro Ser His Pro Lys Arg Phe Gln Ile Asn Ala Lys Asn Tyr Phe 1 5 10 15

Leu Thr Tyr Pro Gln Cys Ser Leu Ser Lys Glu Glu Ser Leu Ser Gln 20 25 30

Leu Gln Ala Leu Asn Thr Pro Ile Asn Lys Lys Phe Ile Lys Ile Cys 35 40 45

Arg Glu Leu His Glu Asp Gly Gln Pro His Leu His Val Leu Ile Gln 50 55 60

Phe 65	Glu	Gly	Lys	Tyr	Cys 70	Cys	Gln	Asn	GIn	Arg 75	Pne	Pne	Asp	Leu	80
Ser	Pro	Thr	Arg	Ser 85	Ala	His	Phe	His	Pro 90	Asn	Ile	Gln	Arg	Ala 95	Lys
Ser	Ser	Ser	Asp 100	Val	Lys	Thr	Tyr	Ile 105	Asp	Lys	Asp	Gly	Asp 110	Thr	Leu
Val	Trp	Gly 115	Glu	Phe	Gln	Val	Asp 120	Gly	Arg	Ser	Ala	Arg 125	Gly	Gly	Cys
Gln	Thr 130	Ser	Asn	Asp	Ala	Ala 135	Ala	Glu	Ala	Leu	Asn 140	Ala	Ser	Ser	Lys
Glu 145	Ala	Ala	Leu	Gln	Ile 150	Ile	Arg	Glu	Lys	Ile 155	Pro	Glu	Lys	Tyr	Leu 160
Phe	Gln	Phe	His	Asn 165	Leu	Asn	Ser	Asn	Leu 170	Asp	Arg	Ile	Phe	Asp 175	Lys
Thr	Pro	Glu	Pro 180	Trp	Leu	Pro	Pro	Phe 185	His	Val	Ser	Ser	Phe 190	Thr	Asn
Val	Pro	Asp 195	Glu	Met	Arg	Gln	Trp 200	Ala	Glu	Asn	Tyr	Phe 205	Gly	Lys	Ser
Ser	Ala 210	Ala	Arg	Pro	Glu	Arg 215	Pro	Ile	Ser	Ile	Ile 220	Ile	Glu	Gly	Asp
Ser 225	Arg	Thr	Gly	Lys	Thr 230	Met	Trp	Ala	Arg	Ser 235	Leu	Gly	Pro	His	Asn 240
Tyr	Leu	Ser	Gly	His 245	Leu	Asp	Leu	Asn	Ser 250	Arg	Val	Tyr	Ser	Asn 255	Lys
Val	Glu	Tyr	Asn 260	Val	Ile	Asp	Asp	Val 265	Thr	Pro	Gln	Tyr	Leu 270	Lys	Leu
Lys	His	Trp	_	Glu	Leu	Ile	Gly		Gln	Arg	Asp	Trp 285		Thr	Asn

Cys Lys Tyr Gly Lys Pro Val Gln Ile Lys Gly Gly Ile Pro Ser Ile 295 290 Val Leu Cys Asn Pro Gly Glu Gly Ala Ser Tyr Lys Val Phe Leu Asp 310 Lys Glu Glu Asn Thr Pro Leu Lys Asn Trp Thr Phe His Asn Ala Lys 325 330 Phe Val Phe Leu Asn Ser Pro Leu Tyr Gln Ser Ser Thr Gln Ser Ser 345 <210> 85 <211> 1056 <212> DNA <213> Tomato golden mosaic virus <220> <221> CDS (1)..(1056) <222> <223> TGMV AL1 EE146 mutant <400> 85 48 atq cca tcq cat cca aaa cgg ttt caa ata aat gcc aaa aat tat ttt Met Pro Ser His Pro Lys Arg Phe Gln Ile Asn Ala Lys Asn Tyr Phe 96 ctt aca tat cct cag tgc tcc ttg tcc aaa gaa gaa tca ctt tct caa Leu Thr Tyr Pro Gln Cys Ser Leu Ser Lys Glu Glu Ser Leu Ser Gln 20 tta caa gcc cta aac act ccg att aac aaa aaa ttc ata aaa atc tgc 144 Leu Gln Ala Leu Asn Thr Pro Ile Asn Lys Lys Phe Ile Lys Ile Cys 35 40 aga gag ctt cat gaa gat ggg caa cct cac ctc cac gtg ctt att cag 192 Arg Glu Leu His Glu Asp Gly Gln Pro His Leu His Val Leu Ile Gln 50 ttc gag gga aaa tac tgc tgc caa aat caa cga ttc ttc gac ctg gta 240 Phe Glu Gly Lys Tyr Cys Cys Gln Asn Gln Arg Phe Phe Asp Leu Val 80 65 70 288 tcc cca aca aqq tca qca cat ttc cat cca aac att cag aga gct aaa Ser Pro Thr Arq Ser Ala His Phe His Pro Asn Ile Gln Arg Ala Lys 85 teq tet tee qae qte aaq aeq tae ate qae aaa gae gga gat aet ett 336 Ser Ser Ser Asp Val Lys Thr Tyr Ile Asp Lys Asp Gly Asp Thr Leu 100 105

gta tgg gga gaa ttc cag gtc gac ggt cga agt gct aga gga ggt tgc

7	'al	Trp	Gly 115	Glu	Phe	Gln	Val	Asp 120	Gly	Arg	Ser	Ala	Arg 125	Gly	Gly	Суѕ	
						gct Ala											432
7						ata Ile 150											480
						cta Leu											528
						ctt Leu											576
						aga Arg											624
1	cc Ser	gct Ala 210	gcg Ala	cgg Arg	ccg Pro	gag Glu	aga Arg 215	cct Pro	att Ile	agt Ser	att Ile	atc Ile 220	atc Ile	gag Glu	ggc Gly	gat Asp	672
:						act Thr 230											720
						ttg Leu											768
						atc Ile											816
	aaa Lys	cat His	tgg Trp 275	aaa Lys	gaa Glu	ctc Leu	att Ile	ggg Gly 280	gcc Ala	caa Gln	aga Arg	gat Asp	tgg Trp 285	cag Gln	act Thr	aac Asn	864
						cca Pro											912
•						gga Gly 310											960
:	aaa Lys	gag Glu	gaa Glu	aac Asn	act Thr 325	cca Pro	cta Leu	aag Lys	aac Asn	tgg Trp 330	act Thr	ttc Phe	cat His	aat Asn	gcg Ala 335	aaa Lys	1008
						tcc Ser											1056

340 345 350

<210> 86

<211> 352

<212> PRT

<213> Tomato golden mosaic virus

<400> 86

Met Pro Ser His Pro Lys Arg Phe Gln Ile Asn Ala Lys Asn Tyr Phe 1 5 10 15

Leu Thr Tyr Pro Gln Cys Ser Leu Ser Lys Glu Glu Ser Leu Ser Gln 20 25 30

Leu Gln Ala Leu Asn Thr Pro Ile Asn Lys Lys Phe Ile Lys Ile Cys 35 40 45

Arg Glu Leu His Glu Asp Gly Gln Pro His Leu His Val Leu Ile Gln 50 55 60

Phe Glu Gly Lys Tyr Cys Cys Gln Asn Gln Arg Phe Phe Asp Leu Val 65 70 75 80

Ser Pro Thr Arg Ser Ala His Phe His Pro Asn Ile Gln Arg Ala Lys 85 90 95

Ser Ser Ser Asp Val Lys Thr Tyr Ile Asp Lys Asp Gly Asp Thr Leu 100 105 110

Val Trp Gly Glu Phe Gln Val Asp Gly Arg Ser Ala Arg Gly Gly Cys 115 120 125

Gln Thr Ser Asn Asp Ala Ala Ala Glu Ala Leu Asn Ala Ser Ser Lys 130 135 140

Phe Gln Phe His Asn Leu Asn Ser Asn Leu Asp Arg Ile Phe Asp Lys
165 170 175

Thr Pro Glu Pro Trp Leu Pro Pro Phe His Val Ser Ser Phe Thr Asn 180 185 190

Ser Ala Ala Arg Pro Glu Arg Pro Ile Ser Ile Ile Glu Gly Asp 215 Ser Arg Thr Gly Lys Thr Met Trp Ala Arg Ser Leu Gly Pro His Asn 235 230 Tyr Leu Ser Gly His Leu Asp Leu Asn Ser Arg Val Tyr Ser Asn Lys 255 250 Val Glu Tyr Asn Val Ile Asp Asp Val Thr Pro Gln Tyr Leu Lys Leu 260 265 Lys His Trp Lys Glu Leu Ile Gly Ala Gln Arg Asp Trp Gln Thr Asn Cys Lys Tyr Gly Lys Pro Val Gln Ile Lys Gly Gly Ile Pro Ser Ile 295 Val Leu Cys Asn Pro Gly Glu Gly Ala Ser Tyr Lys Val Phe Leu Asp 310 315 Lys Glu Glu Asn Thr Pro Leu Lys Asn Trp Thr Phe His Asn Ala Lys 335 325 330 Phe Val Phe Leu Asn Ser Pro Leu Tyr Gln Ser Ser Thr Gln Ser Ser 350 340 345 <210> 87 <211> 1056 <212> DNA <213> Tomato golden mosaic virus <220> <221> CDS <222> (1)..(1056) <223> TGMV AL1 A147Y mutant <400> 87 atq cca tcq cat cca aaa cqq ttt caa ata aat gcc aaa aat tat ttt 48 Met Pro Ser His Pro Lys Arg Phe Gln Ile Asn Ala Lys Asn Tyr Phe 5 10

Val Pro Asp Glu Met Arg Gln Trp Ala Glu Asn Tyr Phe Gly Lys Ser 200

	aca Thr															96
	caa Gln															144
	gag Glu 50															192
	gag Glu															240
	cca Pro															288
	tct Ser															336
_	tgg Trp		_		_	_										384
	aca Thr 130			-	_	_	_									432
_	gaa Glu			_			_									480
	cag Gln						_									528
	cct Pro															576
	cca Pro															624
	gct Ala 210															672
	cgg Arg															720
tat	ttg	agc	<b>a</b> aa	cat	ttg	gat	ctc	aat	tct	agg	gtt	tac	tca	aac	aag	768

Tyr Leu Ser Gly His Leu Asp Leu Asn Ser Arg Val Tyr Ser Asn Lys 245 250 255	
gtt gag tat aac gtc atc gat gtc aca ccg caa tat cta aag ttg Val Glu Tyr Asn Val Ile Asp Asp Val Thr Pro Gln Tyr Leu Lys Leu 260 265 270	816
aaa cat tgg aaa gaa ctc att ggg gcc caa aga gat tgg cag act aac Lys His Trp Lys Glu Leu Ile Gly Ala Gln Arg Asp Trp Gln Thr Asn 275 280 285	864
tgt aaa tac gga aag cca gtt caa att aaa gga ggt atc ccg tca atc Cys Lys Tyr Gly Lys Pro Val Gln Ile Lys Gly Gly Ile Pro Ser Ile 290 295 300	912
gtg ctg tgc aat cct gga gag ggt gct agc tat aaa gtt ttc ctc gac Val Leu Cys Asn Pro Gly Glu Gly Ala Ser Tyr Lys Val Phe Leu Asp 305 310 315 320	960
aaa gag gaa aac act cca cta aag aac tgg act ttc cat aat gcg aaa Lys Glu Glu Asn Thr Pro Leu Lys Asn Trp Thr Phe His Asn Ala Lys 325 330 335	1008
ttc gtc ttc ctc aac tcc ccc ctc tat caa agc tca aca cag agc agc Phe Val Phe Leu Asn Ser Pro Leu Tyr Gln Ser Ser Thr Gln Ser Ser 340 345 350	1056
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<212> PRT <213> Tomato golden mosaic virus	
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<pre>&lt;213&gt; Tomato golden mosaic virus  &lt;400&gt; 88  Met Pro Ser His Pro Lys Arg Phe Gln Ile Asn Ala Lys Asn Tyr Phe 1</pre>	
<pre>&lt;213&gt; Tomato golden mosaic virus &lt;400&gt; 88  Met Pro Ser His Pro Lys Arg Phe Gln Ile Asn Ala Lys Asn Tyr Phe 1</pre>	

Ser	Ser	Ser	Asp 100	Val	Lys	Thr	Tyr	Ile 105	Asp	Lys	Asp	Gly	Asp 110	Thr	Leu
Val	Trp	Gly 115	Glu	Phe	Gln	Val	Asp 120	Gly	Arg	Ser	Ala	Arg 125	Gly	Gly	Cys
Gln	Thr 130	Ser	Asn	Asp	Ala	Ala 135	Ala	Glu	Ala	Leu	Asn 140	Ala	Ser	Ser	Lys
Glu 145	Glu	Tyr	Leu	Gln	Ile 150	Ile	Arg	Glu	Lys	Ile 155	Pro	Glu	Lys	Tyr	Leu 160
Phe	Gln	Phe	His	Asn 165	Leu	Asn	Ser	Asn	Leu 170	Asp	Arg	Ile	Phe	Asp 175	Lys
Thr	Pro	Glu	Pro 180	Trp	Leu	Pro	Pro	Phe 185	His	Val	Ser	Ser	Phe 190	Thr	Asn
Val	Pro	Asp 195	Glu	Met	Arg	Gln	Trp 200	Ala	Glu	Asn	Tyr	Phe 205	Gly	Lys	Ser
Ser	Ala 210	Ala	Arg	Pro	Glu	Arg 215	Pro	Ile	Ser	Ile	Ile 220	Ile	Glu	Gly	Asp
Ser 225	Arg	Thr	Gly	Lys	Thr 230	Met	Trp	Ala	Arg	Ser 235	Leu	Gly	Pro	His	Asn 240
Tyr	Leu	Ser	Gly	His 245	Leu	Asp	Leu	Asn	Ser 250	Arg	Val	Tyr	Ser	Asn 255	Lys
Val	Glu	Tyr	Asn 260	Val	Ile	Asp	Asp	Val 265	Thr	Pro	Gln	Tyr	Leu 270	Lys	Leu
Lys	His	Trp 275	Lys	Glu	Leu	Ile	Gly 280	Ala	Gln	Arg	Asp	Trp 285	Gln	Thr	Asn
Cys	Lys 290	Tyr	Gly	Lys	Pro	Val 295	Gln	Ile	Lys	Gly	Gly 300	Ile	Pro	Ser	Ile
Val 305	Leu	Cys	Asn	Pro	Gly 310	Glu	Gly	Ala	Ser	Tyr 315	Lys	Val	Phe	Leu	Asp 320

Lys Glu Glu Asn Thr Pro Leu Lys Asn Trp Thr Phe His Asn Ala Lys 325 330 335

Phe Val Phe Leu Asn Ser Pro Leu Tyr Gln Ser Ser Thr Gln Ser Ser 340  $\phantom{\bigg|}345\phantom{\bigg|}350\phantom{\bigg|}$ 

<210><211><211><212><213>	89 1056 DNA Tomat	to go	older	ı mos	saic	vir	ıs				
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ctt aca Leu Thi			_	_		_		_			96
tta caa Leu Glr											144
aga gaq Arg Glu 50											192
ttc gag Phe Glu 65											240
tcc cca Ser Pro											288
tcg tct Ser Ser		_	_						_	_	336
gta tgg Val Tr											384
caa aca Gln Th	s Ser										432

					ata Ile 150											480
					cta Leu											528
					ctt Leu											576
					aga Arg											624
					gag Glu											672
					act Thr 230											720
tat Tyr	ttg Leu	agc Ser	gly ggg	cat His 245	ttg Leu	gat Asp	ctc Leu	aat Asn	tct Ser 250	agg Arg	gtt Val	tac Tyr	tca Ser	aac Asn 255	aag Lys	768
					atc Ile											816
					ctc Leu											864
					cca Pro											912
					gga Gly 310											960
					cca Pro										Lys	1008
					tcc Ser											1056

<210> 90

<211> 352

<212> PRT

<213> Tomato golden mosaic virus

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Met Pro Ser His Pro Lys Arg Phe Gln Ile Asn Ala Lys Asn Tyr Phe 1 5 10 15

Leu Thr Tyr Pro Gln Cys Ser Leu Ser Lys Glu Glu Ser Leu Ser Gln 20 25 30

Leu Gln Ala Leu Asn Thr Pro Ile Asn Lys Lys Phe Ile Lys Ile Cys
35 40 45

Arg Glu Leu His Glu Asp Gly Gln Pro His Leu His Val Leu Ile Gln 50 55 60

Phe Glu Gly Lys Tyr Cys Cys Gln Asn Gln Arg Phe Phe Asp Leu Val 65 70 75 80

Ser Pro Thr Arg Ser Ala His Phe His Pro Asn Ile Gln Arg Ala Lys 85 90 95

Ser Ser Ser Asp Val Lys Thr Tyr Ile Asp Lys Asp Gly Asp Thr Leu 100 105 110

Val Trp Gly Glu Phe Gln Val Asp Gly Arg Ser Ala Arg Gly Gly Cys 115 120 125

Gln Thr Ser Asn Asp Ala Ala Ala Glu Ala Leu Asn Ala Ser Ser Lys 130 135 140

Glu Glu Ala Ala Gln Ile Ile Arg Glu Lys Ile Pro Glu Lys Tyr Leu 145 150 155 160

Phe Gln Phe His Asn Leu Asn Ser Asn Leu Asp Arg Ile Phe Asp Lys 165 170 175

Thr Pro Glu Pro Trp Leu Pro Pro Phe His Val Ser Ser Phe Thr Asn 180 185 190

Val Pro Asp Glu Met Arg Gln Trp Ala Glu Asn Tyr Phe Gly Lys Ser 195 200 205

Ser Ala Ala Arg Pro Glu Arg Pro Ile Ser Ile Ile Ile Glu Gly Asp 210 215 220

Ser Arg Thr 225		nr Met Trp 30	Ala Arg	Ser Leu 235	Gly Pro	His Asn 240	
Tyr Leu Ser	Gly His L	eu Asp Leu	Asn Ser 250	Arg Val	Tyr Ser	Asn Lys 255	
Val Glu Tyr	Asn Val I 260	le Asp Asp	Val Thr 265	Pro Gln	Tyr Leu 270	Lys Leu	
Lys His Trp 275	Lys Glu L	eu Ile Gly 280		Arg Asp	Trp Gln 285	Thr Asn	
Cys Lys Tyr 290	Gly Lys P	ro Val Gln 295	Ile Lys	Gly Gly 300	Ile Pro	Ser Ile	
Val Leu Cys 305		ly Glu Gly 10	Ala Ser	Tyr Lys 315	Val Phe	Leu Asp 320	
Lys Glu Glu	Asn Thr P 325	ro Leu Lys	Asn Trp 330	Thr Phe	His Asn	Ala Lys 335	
Phe Val Phe	Leu Asn S 340	er Pro Leu	Tyr Gln 345	Ser Ser	Thr Gln 350	Ser Ser	
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tta caa gcc Leu Gln Ala 35		_				_	144

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	gag Glu															240
	cca Pro				_							_	_	-		288
_	tct Ser		-	-	_	-			-		-		_			336
_	tgg Trp		_			_			-		_	_			_	384
	aca Thr 130			_	_	_	-									432
_	gag Glu	_		_			_					_				480
	cag Gln						_			_				_	_	528
	cct	паа	CCa	taa			ccg	ttc	cac	atc	tca	tca	ttt	act	aac	576
	Pro	-			Leu	Pro	Pro			-	Ser	Ser	Phe 190	Thr		
gtg	Pro cca Pro	Glu	Pro 180 gag	Trp	aga	caa	tgg	Phe 185 gct	His gaa	Val	tat	ttt	190 gga	aag	Asn agt	624
gtg Val	cca	Glu gac Asp 195 gcg	Pro 180 gag Glu cgg	Trp atg Met	aga Arg gag	caa Gln aga	tgg Trp 200 cct	Phe 185 gct Ala att	His gaa Glu agt	Val aat Asn	tat Tyr atc	ttt Phe 205 atc	190 gga Gly gag	aag Lys ggc	Asn agt Ser gat	62 <b>4</b> 672
gtg Val tcc Ser	cca Pro gct Ala	gac Asp 195 gcg Ala	Pro 180 gag Glu cgg Arg	Trp atg Met ccg Pro	aga Arg gag Glu	caa Gln aga Arg 215 atg	tgg Trp 200 cct Pro	Phe 185 gct Ala att Ile	gaa Glu agt Ser	Val aat Asn att Ile	tat Tyr atc Ile 220	ttt Phe 205 atc Ile	gga Gly gag Glu cca	aag Lys ggc Gly	Asn agt Ser gat Asp	
gtg Val tcc Ser agt Ser 225	cca Pro gct Ala 210	gac Asp 195 gcg Ala acg Thr	Pro 180 gag Glu cgg Arg gga Gly	Trp atg Met ccg Pro aag Lys cat	aga Arg gag Glu act Thr 230	caa Gln aga Arg 215 atg Met	tgg Trp 200 cct Pro tgg Trp	Phe 185 gct Ala att Ile gct Ala aat	gaa Glu agt Ser cgt Arg	Val aat Asn att Ile tca Ser 235 agg	tat Tyr atc Ile 220 cta Leu	ttt Phe 205 atc Ile ggc Gly	190 gga Gly gag Glu cca Pro	aag Lys ggc Gly cat His	Asn agt Ser gat Asp aat Asn 240 aag	672

			cc caa aga ga la Gln Arg As <sub>l</sub>		
-		_	tt aaa gga gg le Lys Gly Gl 30	y Ile Pro Ser	
		Glu Gly Al	ct agc tat aa la Ser Tyr Ly: 315	_	-
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Leu Thr Tyr	Pro Gln Cys	Ser Leu Se 25	er Lys Glu Gl <sup>.</sup> 5	u Ser Leu Ser 30	Gln
Leu Gln Ala 35	Leu Asn Thr	Pro Ile As 40	sn Lys Lys Ph	e Ile Lys Ile 45	Cys
Arg Glu Leu 50	His Glu Asp	Gly Gln Pr 55	ro His Leu Hi 60		Gln
Phe Glu Gly 65	Lys Tyr Cys 70	Cys Gln As	sn Gln Arg Pho 75	e Phe Asp Leu	Val 80
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Ser Ser Ser	Asp Val Lys	-	le Asp Lys As <sub>]</sub> 05	p Gly Asp Thr 110	Leu
Val Trp Gly	Glu Phe Glr	. Val Asp Gl	ly Arg Ser Ala	a Arg Gly Gly	Суз

115 120 125

Gln	Thr 130	Ser	Asn	Asp	Ala	Ala 135	Ala	Glu	Ala	Leu	Asn 140	Ala	Ser	Ser	Lys
Glu 145	Glu	Ala	Val	Gln	Ile 150	Ile	Arg	Glu	Lys	Ile 155	Pro	Glu	Lys	Tyr	Leu 160
Phe	Gln	Phe	His	Asn 165	Leu	Asn	Ser	Asn	Leu 170	Asp	Arg	Ile	Phe	Asp 175	Lys
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Val	Pro	Asp 195	Glu	Met	Arg	Gln	Trp 200	Ala	Glu	Asn	Tyr	Phe 205	Gly	Lys ·	Ser
Ser	Ala 210	Ala	Arg	Pro	Glu	Arg 215	Pro	Ile	Ser	Ile	Ile 220	Ile	Glu	Gly	Asp
Ser 225	Arg	Thr	Gly	Lys	Thr 230	Met	Trp	Ala	Arg	Ser 235	Leu	Gly	Pro	His	Asn 240
Tyr	Leu	Ser	Gly	His 245	Leu	Asp	Leu	Asn	Ser 250	Arg	Val	Tyr	Ser	Asn 255	Lys
Val	Glu	Tyr	Asn 260	Val	Ile	Asp	Asp	Val 265	Thr	Pro	Gln	Tyr	Leu 270	Lys	Leu
Lys	His	Trp 275	Lys	Glu	Leu	Ile	Gly 280	Ala	Gln	Arg	Asp	Trp 285	Gln	Thr	Asn
Сув	Lys 290	Tyr	Gly	Lys	Pro	Val 295	Gln	Ile	Lys	Gly	Gly 300	Ile	Pro	Ser	Ile
Val 305	Leu	Cys	Asn	Pro	Gly 310	Glu	Gly	Ala	Ser	Tyr 315	Lys	Val	Phe	Leu	Asp 320
Lys	Glu	Glu	Asn	Thr 325	Pro	Leu	Lys	Asn	Trp 330	Thr	Phe	His	Asn	Ala 335	Lys

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ctt aca tat cct cag tgc tcc ttg tcc aaa gaa gaa tca ctt tct caa Leu Thr Tyr Pro Gln Cys Ser Leu Ser Lys Glu Glu Ser Leu Ser Gln 20 25 30	96
tta caa gcc cta aac act ccg att aac aaa aaa ttc ata aaa atc tgc Leu Gln Ala Leu Asn Thr Pro Ile Asn Lys Lys Phe Ile Lys Ile Cys 35 40 45	144
aga gag ctt cat gaa gat ggg caa cct cac ctc cac gtg ctt att cag Arg Glu Leu His Glu Asp Gly Gln Pro His Leu His Val Leu Ile Gln 50 55 60	192
ttc gag gga aaa tac tgc tgc caa aat caa cga ttc ttc gac ctg gta Phe Glu Gly Lys Tyr Cys Cys Gln Asn Gln Arg Phe Phe Asp Leu Val 65 70 75 80	240
tcc cca aca agg tca gca cat ttc cat cca aac att cag aga gct aaa Ser Pro Thr Arg Ser Ala His Phe His Pro Asn Ile Gln Arg Ala Lys 85 90 95	288
tcg tct tcc gac gtc aag acg tac atc gac aaa gac gga gat act ctt Ser Ser Ser Asp Val Lys Thr Tyr Ile Asp Lys Asp Gly Asp Thr Leu 100 105 110	336
gta tgg gga gaa ttc cag gtc gac ggt cga agt gct aga gga ggt tgc Val Trp Gly Glu Phe Gln Val Asp Gly Arg Ser Ala Arg Gly Gly Cys 115 120 125	384
caa aca tct aac gac gct gca gca gag gcg tta aat gct tct tcc aaa Gln Thr Ser Asn Asp Ala Ala Ala Glu Ala Leu Asn Ala Ser Ser Lys 130 135 140	432
gaa gaa gcc gtt cag ata att aga gag aaa atc cca gaa aaa tat tta Glu Glu Ala Val Gln Ile Ile Arg Glu Lys Ile Pro Glu Lys Tyr Leu 145 150 155 160	480
ttt cag ttc cac aat cta aat agc aat tta gat agg ata ttt gat aag Phe Gln Phe His Asn Leu Asn Ser Asn Leu Asp Arg Ile Phe Asp Lys 165 170 175	528

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					aga Arg											624
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	_				ttg Leu						_					768
_				_	atc Ile	_	_	_		_				_	_	816
				_	ctc Leu			_		_	_		_			864
					cca Pro											912
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<211> 352

<212> PRT

<213> Tomato golden mosaic virus

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Leu	Gln	Ala 35	Leu	Asn	Thr	Pro	Ile 40	Asn	Lys	Lys	Phe	Ile 45	Lys	Ile	Cys
Arg	Glu 50	Leu	His	Glu	Asp	Gly 55	Gln	Pro	His	Leu	His 60	Val	Leu	Ile	Gln
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Ser	Pro	Thr	Arg	Ser 85	Ala	His	Phe	His	Pro 90	Asn	Ile	Gln	Arg	Ala 95	Lys
Ser	Ser	Ser	Asp 100	Val	Lys	Thr	Tyr	Ile 105	Asp	Lys	Asp	Gly	Asp 110	Thr	Leu
Val	Trp	Gly 115	Glu	Phe	Gln	Val	Asp 120	Gly	Arg	Ser	Ala	Arg 125	Gly	Gly	Cys
Gln	Thr 130	Ser	Asn	Asp	Ala	Ala 135	Ala	Glu	Ala	Leu	Asn 140	Ala	Ser	Ser	Lys
Glu 145	Glu	Ala	Val	Gln	Ile 150	Ile	Arg	Glu	Lys	Ile 155	Pro	Glu	Lys	Tyr	Leu 160
Phe	Gln	Phe	His	Asn 165	Leu	Asn	Ser	Asn	Leu 170	Asp	Arg	Ile	Phe	Asp 175	Lys
Thr	Pro	Glu	Pro 180	Trp	Leu	Pro	Pro	Phe 185	His	Val	Ser	Ser	Phe 190	Thr	Asn
Val	Pro	Asp 195	Glu	Met	Arg	Gln	Trp 200	Ala	Glu	Asn	Tyr	Phe 205	Gly	Lys	Ser
Ser	Ala 210	Ala	Arg	Pro	Glu	Arg 215	Pro	Ile	Ser	Ile	Ile 220	Ile	Glu	Gly	Asp
Ser 225	Arg	Thr	Gly	Lys	Thr 230	Met	Trp	Ala	Arg	Ser 235	Leu	Gly	Pro	His	Asn 240
Tyr	Leu	Ser	Gly	His	Leu	Asp	Leu	Asn	Ser	Arg	Val	Tyr	Ser	Asn	Lys

Val	Glu	Tyr	Asn 260	Val	Ile	Asp	Asp	Val 265	Thr	Pro	Gln	Tyr	Leu 270	Lys	Leu	
ГÀЗ	His	Trp 275	Lys	Glu	Leu	Ile	Gly 280	Ala	Gln	Arg	Asp	Trp 285	Gln	Thr	Asn	
Cys	Lys 290	Tyr	Gly	Lys	Pro	Val 295	Gln	Ile	Lys	Gly	Gly 300	Ile	Pro	Ser	Ile	
Val 305	Leu	Cys	Asn	Pro	Gly 310	Glu	Gly	Ala	Ser	Tyr 315	Lys	Val	Phe	Leu	Asp 320	
Lys	Glu	Glu	Asn	Thr 325	Pro	Leu	Lys	Asn	Trp 330	Thr	Phe	His	Asn	Ala 335	Lys	
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								aat			ttc Phe					240

65	70	75	80
	er Ala His Phe His	cca aac att cag aga Pro Asn Ile Gln Arg 90	
		gac aaa gac gga gat Asp Lys Asp Gly Asp 110	
		cga agt gct aga gga Arg Ser Ala Arg Gly 125	
		gcg tta aat gct tct Ala Leu Asn Ala Ser 140	
		aaa atc cca gaa aaa Lys Ile Pro Glu Lys 155	
Phe Gln Phe His A	~	tta gat agg ata ttt Leu Asp Arg Ile Phe 170	-
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		gaa aat tat ttt gga Glu Asn Tyr Phe Gly 205	
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Tyr Leu Ser Gly H		tct agg gtt tac tca Ser Arg Val Tyr Ser 250	_
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		caa aga gat tgg cag Gln Arg Asp Trp Gln 285	
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Thr	Pro	Glu	Pro 180	Trp	Leu	Pro	Pro	Phe 185	His	Val	Ser	Ser	Phe 190	Thr	Asn
Val	Pro	Asp 195	Glu	Met	Arg	Gln	Trp 200	Ala	Glu	Asn	Tyr	Phe 205	Gly	Lys	Ser
Ser	Ala 210	Ala	Arg	Pro	Glu	Arg 215	Pro	Ile	Ser	Ile	Ile 220	Ile	Glu	Gly	Asp
Ser 225	Arg	Thr	Gly	Lys	Thr 230	Met	Trp	Ala	Arg	Ser 235	Leu	Gly	Pro	His	Asn 240
Tyr	Leu	Ser	Gly	His 245	Leu	Asp	Leu	Asn	Ser 250	Arg	Val	Tyr	Ser	Asn 255	Lys
Val	Glu	Tyr	Asn 260	Val	Ile	Asp	Asp	Val 265	Thr	Pro	Gln	Tyr	Leu 270	Lys	Leu
Lys	His	Trp 275	Lys	Glu	Leu	Ile	Gly 280	Ala	Gln	Arg	Asp	Trp 285	Gln	Thr	Asn
Cys	Lys 290	Tyr	Gly	Lys	Pro	Val 295	Gln	Ile	Lys	Gly	Gly 300	Ile	Pro	Ser	Ile
Val 305	Leu	Cys	Asn	Pro	Gly 310	Glu	Gly	Ala	Ser	Tyr 315	Lys	Val	Phe	Leu	Asp 320
Lys	Glu	Glu	Asn	Thr 325	Pro	Leu	Lys	Asn	Trp 330	Thr	Phe	His	Asn	Ala 335	Lys
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<213> Tomato golden mosaic virus

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Val Pro Asp Glu Met Arg Gln Trp Ala Glu Asn Tyr Phe Gly Lys Ser

205 195 200

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	cgg Arg								720
	ttg Leu								768
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<213> Tomato golden mosaic virus

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Phe 65	Glu	Gly	Lys	Tyr	Cys 70	Cys	Gln	Asn	Gln	Arg 75	Phe	Phe	Asp	Leu	Val 80
Ser	Pro	Thr	Arg	Ser 85	Ala	His	Phe	His	Pro 90	Asn	Ile	Gln	Arg	Ala 95	Lys
Ser	Ser	Ser	Asp 100	Val	Lys	Thr	Tyr	Ile 105	Asp	Lys	Asp	Gly	Asp 110	Thr	Leu
Val	Trp	Gly 115	Glu	Phe	Gļn	Val	Asp 120	Gly	Arg	Ser	Ala	Arg 125	Gly	Gly	Cys
Gln	Thr 130	Ser	Asn	Asp	Ala	Ala 135	Ala	Glu	Ala	Leu	Asn 140	Ala	Ser	Ser	Lys
Glu 145	Glu	Ala	Leu	Gln	Ala 150	Ala	Arg	Glu	Lys	Ile 155	Pro	Glu	Lys	Tyr	Leu 160
Phe	Gln	Phe	His	Asn 165	Leu	Asn	Ser	Asn	Leu 170	Asp	Arg	Ile	Phe	Asp 175	Lys
Thr	Pro	Glu	Pro 180	Trp	Leu	Pro	Pro	Phe 185	His	Val	Ser	Ser	Phe 190	Thr	Asn
Val	Pro	Asp 195	Glu	Met	Arg	Gln	Trp 200	Ala	Glu	Asn	Tyr	Phe 205	Gly	Lys	Ser
Ser	Ala 210	Ala	Arg	Pro	Glu	Arg 215	Pro	Ile	Ser	Ile	Ile 220	Ile	Glu	Gly	Asp
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Tyr	Leu	Ser	Gly	His 245	Leu	Asp	Leu	Asn	Ser 250	Arg	Val	Tyr	Ser	Asn 255	Lys
Val	Glu	Tyr	Asn 260	Val	Ile	Asp	Asp	Val 265	Thr	Pro	Gln	Tyr	Leu 270	Lys	Leu

Lys His Trp Lys Glu Leu Ile Gly Ala Gln Arg Asp Trp Gln Thr Asn 275 280 285 Cys Lys Tyr Gly Lys Pro Val Gln Ile Lys Gly Gly Ile Pro Ser Ile 295 290 Val Leu Cys Asn Pro Gly Glu Gly Ala Ser Tyr Lys Val Phe Leu Asp 315 310 Lys Glu Glu Asn Thr Pro Leu Lys Asn Trp Thr Phe His Asn Ala Lys 325 330 Phe Val Phe Leu Asn Ser Pro Leu Tyr Gln Ser Ser Thr Gln Ser Ser 345 340 <210> 99 <211> 25 <212> PRT <213> Tomato golden mosaic virus <220> <221> MISC\_FEATURE <222> (1)..(25) <223> Amino acids 132-156 of TGMV AL1 <400> 99 Asn Asp Ala Ala Glu Ala Leu Asn Ala Ser Ser Lys Glu Glu Ala 10 Leu Gln Ile Ile Arg Glu Lys Ile Pro 20 <210> 100 <211> 13 <212> PRT <213> Tomato golden mosaic virus <220> <221> MISC FEATURE <222> (1)..(13) <223> TGMV AL1 amino acids 144-156 <400> 100 Lys Glu Glu Ala Leu Gln Ile Ile Arg Glu Lys Ile Pro 5 10

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                            40
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Ala Arg Glu Glu His Ser Asp Gly Phe Pro His Leu His Cys Leu Ile
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Gln Leu Ser Gly Lys Ser Asn Ile Lys Asp Ala Arg Phe Phe Asp Ile
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Thr His Pro Arg Arg Ser Ala Asn Phe His Pro Asn Ile Gln Ala Ala
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Asp	Asp 130	Val	Tyr	His	Asn	Ala 135	Val	Asn	Ala	Gly	Cys 140	Val	Glu	Glu	Ala
Leu 145	Ala	Ile	Ile	Arg	Ala 150	Gly	Asp	Pro	Lys	Thr 155	Phe	Ile	Val	Ser	Tyr 160
His	Asn	Val	Arg	Ala 165	Asn	Ile	Glu	Arg	Leu 170	Phe	Thr	Lys	Ala	Pro 175	Glu
Pro	Trp	Ala	Pro 180	Pro	Phe	Gln	Leu	Ser 185	Ser	Phe	Thr	Asn	Val 190	Pro	Asp
Glu	Met	Ser 195	Ser	Trp	Ala	Asp	Asp 200	Tyr	Phe	Gly	Arg	Ser 205	Ala	Ala	Ala
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Asn 305		Gly	Glu	Gly	Ser 310	Ser	Tyr	Ile	Ser	Phe 315	Leu	Asn	Lys	Glu	Glu 320
Asn	Ala	Ser	Leu	Arg	Ala	Trp	Thr	Thr	Lys	Asn	Ala	Lys	Phe	Ile	Thr

Leu Glu Ala Pro Leu Tyr Gln Ser Thr Ala Gln Asp Cys 340 345

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<211> 70

<212> PRT

<213> cabbage leaf curl virus

<220>

<221> MISC FEATURE

<222> (1)..(70)

<223> Wild-type CbLCV AL1 amino acids 111-180

<400> 108

Asp Tyr Cys Glu Ser Gly Gln Tyr Lys Val Ser Gly Gly Thr Lys Ala 1 5 10 15

Asn Lys Asp Asp Val Tyr His Asn Ala Val Asn Ala Gly Cys Val Glu 20 25 30

Glu Ala Leu Ala Ile Ile Arg Ala Gly Asp Pro Lys Thr Phe Ile Val 35 40 45

Ser Tyr His Asn Val Arg Ala Asn Ile Glu Arg Leu Phe Thr Lys Ala 50 55 60

Pro Glu Pro Trp Ala Pro 65 70

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<213> cabbage leaf curl virus

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<222> (35)..(35)

<223> L145A mutation

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Asp Tyr Cys Glu Ser Gly Gln Tyr Lys Val Ser Gly Gly Thr Lys Ala 1 5 10 15 Asn Lys Asp Asp Val Tyr His Asn Ala Val Asn Ala Gly Cys Val Glu 20 25 30

Glu Ala Ala Ile Ile Arg Ala Gly Asp Pro Lys Thr Phe Ile Val 35 40 45

Ser Tyr His Asn Val Arg Ala Asn Ile Glu Arg Leu Phe Thr Lys Ala 50 55 60

Pro Glu Pro Trp Ala Pro 65 70

<210> 110

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<212> DNA

<213> cabbage leaf curl virus

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<222> (1)..(1047)

<223> CbLCV AL1 coding sequence

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atcgtgctgt gcaatccagg agaggggagc agttatataa gtttcctcaa caaagaggaa	960												
aatgcatcac taagagcgtg gactaccaaa aatgcaaaat tcatcactct tgaagccccc	1020												
ctctatcaaa gcacagcaca agattgc	1047												
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<pre>&lt;400&gt; 111 atg cca cga aac cct aaa tcg ttt cgt tta gca gcc cga aat ata ttc Met Pro Arg Asn Pro Lys Ser Phe Arg Leu Ala Ala Arg Asn Ile Phe 1 5 10 15</pre>	48												
tta aca tat ccc cag tgc gac ata ccc aaa gat gaa gct ctt cag atg Leu Thr Tyr Pro Gln Cys Asp Ile Pro Lys Asp Glu Ala Leu Gln Met 20 25 30	96												
ctt caa acc ctg tcg tgg tca gtc gtc aaa ccc aca tac atc aga gtc Leu Gln Thr Leu Ser Trp Ser Val Val Lys Pro Thr Tyr Ile Arg Val 35 40 45	144												
gca aga gag gaa cat tca gac ggg ttc ccc cat tta cac tgt ctc atc Ala Arg Glu Glu His Ser Asp Gly Phe Pro His Leu His Cys Leu Ile 50 55 60	192												
caa cta tca gga aag tcg aac atc aag gat gct aga ttt ttc gac atc Gln Leu Ser Gly Lys Ser Asn Ile Lys Asp Ala Arg Phe Phe Asp Ile 65 70 75 80	240												
act cac ccc aga agg tct gcc aat ttt cac cca aac att cag gca gcc Thr His Pro Arg Arg Ser Ala Asn Phe His Pro Asn Ile Gln Ala Ala 85 90 95	288												
aaa gac acc aat gcc gtc aag aat tac atc acc aaa gat ggt gat tat Lys Asp Thr Asn Ala Val Lys Asn Tyr Ile Thr Lys Asp Gly Asp Tyr 100 105 110	336												
tgt gaa tcc ggg cag tac aag gtg tct ggg ggt aca aag gca aat aaa Cys Glu Ser Gly Gln Tyr Lys Val Ser Gly Gly Thr Lys Ala Asn Lys 115 120 125	384												
gac gac gtc tac cac aac gcc gtc aat gcg gga tgt gtg gaa gag gcg Asp Asp Val Tyr His Asn Ala Val Asn Ala Gly Cys Val Glu Glu Ala 130 135 140	432												
gcc gca att ata agg gct gga gat cca aag acg ttc att gtt agt tat	480												

Ala 145	Ala	Ile	Ile	Arg	Ala 150	Gly	Asp	Pro	Lys	Thr 155	Phe	Ile	Val	Ser	Tyr 160	
cat His	aat Asn	gtt Val	aga Arg	gct Ala 165	aac Asn	ata Ile	gag Glu	cga Arg	ctc Leu 170	ttt Phe	act Thr	aag Lys	gct Ala	ccg Pro 175	gaa Glu	528
cca Pro	tgg Trp	gct Ala	cct Pro 180	ccg Pro	ttt Phe	caa Gln	ctc Leu	tcc Ser 185	tcc Ser	ttt Phe	act Thr	aac Asn	gtc Val 190	ccg Pro	gac Asp	576
gag Glu	atg Met	agt Ser 195	tca Ser	tgg Trp	gca Ala	gat Asp	gac Asp 200	tat Tyr	ttt Phe	ggt Gly	cgg Arg	agt Ser 205	gcc Ala	gct Ala	gcg Ala	624
cgg Arg	gcg Ala 210	gaa Glu	aga Arg	cct Pro	att Ile	agt Ser 215	atc Ile	ata Ile	gtt Val	gaa Glu	ggt Gly 220	gat Asp	tca Ser	cga Arg	acc Thr	672
ggc Gly 225	aag Lys	acc Thr	atg Met	tgg Trp	gcg Ala 230	cgt Arg	gct Ala	tta Leu	gga Gly	cca Pro 235	cat His	aat Asn	tat Tyr	ttg Leu	agt Ser 240	720
gly ggg	cac His	ctc Leu	gac Asp	ttt Phe 245	aat Asn	tca Ser	aag Lys	gtc Val	ttt Phe 250	tca Ser	aat Asn	aat Asn	gcg Ala	gag Glu 255	tat Tyr	768
aac Asn	gtc Val	att Ile	gat Asp 260	gac Asp	ata Ile	gct Ala	ccg Pro	cat His 265	tat Tyr	cta Leu	aag Lys	cta Leu	aag Lys 270	cac His	tgg Trp	816
aaa Lys	gag Glu	ctt Leu 275	att Ile	gly ggg	gcc Ala	caa Gln	agg Arg 280	gac Asp	tgg Trp	caa Gln	tca Ser	aac Asn 285	tgt Cys	aag Lys	tac Tyr	864
ggc Gly	aag Lys 290	cca Pro	gtt Val	caa Gln	att Ile	aaa Lys 295	Gly	ggc Gly	ata Ile	ccc Pro	tca Ser 300	atc Ile	gtg Val	ctg Leu	tgc Cys	912
aat Asn 305	Pro	gga Gly	gag Glu	gly	agc Ser 310	Ser	tat Tyr	ata Ile	agt Ser	ttc Phe 315	Leu	aac Asn	aaa Lys	gag Glu	gaa Glu 320	960
aat Asn	gca Ala	tca Ser	cta Leu	aga Arg 325	gcg Ala	tgg Trp	act Thr	acc Thr	aaa Lys 330	Asn	gca Ala	aaa Lys	ttc Phe	atc Ile 335	Thr	1008
ctt Leu	gaa Glu	gcc Ala	ccc Pro	Leu	tat Tyr	caa Gln	agc Ser	aca Thr 345	Ala	caa Gln	gat Asp	tgc Cys	!			1047

<210> 112 <211> 349

<212> PRT

<213> cabbage leaf curl virus

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Leu Thr Tyr Pro Gln Cys Asp Ile Pro Lys Asp Glu Ala Leu Gln Met 20 25 30

Leu Gln Thr Leu Ser Trp Ser Val Val Lys Pro Thr Tyr Ile Arg Val 35 40 45

Ala Arg Glu Glu His Ser Asp Gly Phe Pro His Leu His Cys Leu Ile 50 55 60

Gln Leu Ser Gly Lys Ser Asn Ile Lys Asp Ala Arg Phe Phe Asp Ile 65 70 75 80

Thr His Pro Arg Arg Ser Ala Asn Phe His Pro Asn Ile Gln Ala Ala 85 90 95

Lys Asp Thr Asn Ala Val Lys Asn Tyr Ile Thr Lys Asp Gly Asp Tyr 100 105 110

Cys Glu Ser Gly Gln Tyr Lys Val Ser Gly Gly Thr Lys Ala Asn Lys 115 120 125

Asp Asp Val Tyr His Asn Ala Val Asn Ala Gly Cys Val Glu Glu Ala 130 135 140

Ala Ala Ile Ile Arg Ala Gly Asp Pro Lys Thr Phe Ile Val Ser Tyr 145 150 155 160

His Asn Val Arg Ala Asn Ile Glu Arg Leu Phe Thr Lys Ala Pro Glu 165 170 175

Pro Trp Ala Pro Pro Phe Gln Leu Ser Ser Phe Thr Asn Val Pro Asp 180 185 190

Glu Met Ser Ser Trp Ala Asp Asp Tyr Phe Gly Arg Ser Ala Ala Ala 195 200 205

Arg Ala Glu Arg Pro Ile Ser Ile Ile Val Glu Gly Asp Ser Arg Thr 210 215 220

Gly 225	Lys	Thr	Met	Trp	Ala 230	Arg	Ala	Leu	Gly	Pro 235	His	Asn	Tyr	Leu	Ser 240
Gly	His	Leu	Asp	Phe 245	Asn	Ser	Lys	Val	Phe 250	Ser	Asn	Asn	Ala	Glu 255	Tyr
Asn	Val	Ile	Asp 260	Asp	Ile	Ala	Pro	His 265	Tyr	Leu	Lys	Leu	Lys 270	His	Trp
Lys	Glu	Leu 275	Ile	Gly	Ala	Gln	Arg 280	Asp	Trp	Gln	Ser	Asn 285	Cys	Lys	Tyr
Gly	Lys 290	Pro	Val	Gln	Ile	Lys 295	Gly	Gly	Ile	Pro	Ser 300	Ile	Val	Leu	Cys
Asn 305	Pro	Gly	Glu	Gly	Ser 310	Ser	Tyr	Ile	Ser	Phe 315	Leu	Asn	Lys	Glu	Glu 320
Asn	Ala	Ser	Leu	Arg 325		Trp	Thr	Thr	Lys 330	Asn	Ala	Lys	Phe	Ile 335	Thr
Leu	Glu	Ala	Pro	Leu	Tyr	Gln	Ser	Thr 345	Ala	Gln	Asp	Cys			